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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY
WITH INDEXES

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA Information System during February, 1967



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WASHINGTON, D.C.

MARCH 1967

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Aerospace Medicine and Biology is a continuing bibliography which, by means of periodic supplements, serves as a current abstracting and announcement medium for references on this subject. The publication is compiled through the cooperative efforts of the Aerospace Medicine and Biology Bibliography Project of the Library of Congress (LC), the American Institute of Aeronautics and Astronautics (AIAA), and NASA. It assembles, within the covers of a single bibliographic announcement, groups of references that were formerly announced in separate journals, and provides a convenient compilation for medical and biological scientists. Additional background details for this publication can be found in the first issue, NASA SP-7011, which was published in July, 1964. Supplements are identified by the same number followed by two additional digits in parentheses.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis will be placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion. The contents of this issue are comprised of abstracts that were prepared by the three contributing organizations.

Each entry consists of a standard citation accompanied by its abstract. It is included in one of three groups of references that appear in the following order:

- a. NASA entries identified by their *STAR* accession numbers (N67-10000 series),
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- c. LC entries identified by a number in the A67-80000 series.

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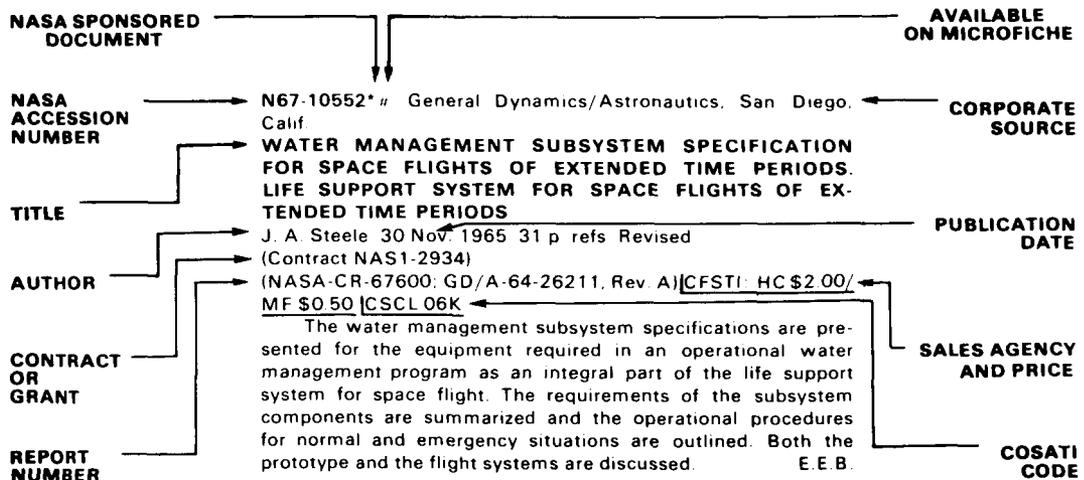
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TYPICAL CITATION AND ABSTRACT





AEROSPACE MEDICINE AND BIOLOGY

a continuing bibliography

MARCH 1967

STAR ENTRIES

N67-12341# Joint Publications Research Service, Washington, D. C.

REPORTS ON SOVIET RESEARCH IN THE FIELD OF BIONICS

A. I. Prokhorov, ed. 21 Nov. 1966 145 p refs Transl. into ENGLISH of the Publ. XXII Vsesoyuznaya Nauchnaya Sessiya, Posvyashchennaya Dnyu Radio. Doklady Seksii Bioniki (Moscow), 1966 p 1-135
(JPRS-38716; TT-66-35140) CFSTI: \$4.00

The conference proceedings which are presented cover various aspects of man-machine systems, model construction of human systems, simulation studies, computer processing techniques, and bioelectrical effects. M. G. J.

N67-12342# Joint Publications Research Service, Washington, D. C.

SOME PROBLEMS IN MONITORING, PROGNOSIS AND CONTROL OF THE STATE OF THE MAN-MACHINE SYSTEM

A. I. Prokhorov *In its Rept. on Soviet Res. in the Field of Bionics* 21 Nov. 1966 p 1-4 (See N67-12341 03-05) CFSTI: \$4.00

The difficulty, efficiency, and reliability of various methods of monitoring, predicting, and controlling the state of the human operator in man-machine systems are discussed. The dependence of the capacity to work on the physiological and psychological states is considered. Parameters describing the state are divided into two classes for discussion: dynamic (e.g., attention, perception, ready-access memory) and static (e.g., typological and age characteristics, habits, behavior modes). Also discussed is the possibility of an automatic control system with feedback, which by evaluating the general emotional tension of the operator in accord with evaluating and directing his attention, controls the state of the human operator. L. E. W.

N67-12343# Joint Publications Research Service, Washington, D. C.

UNIVERSAL ANALYZER OF A MULTICHANNEL DIAGNOSTIC SYSTEM MADE OF STANDARD ELEMENTS

R. S. Dadashev *In its Rept. on Soviet Res. in the Field of Bionics* 21 Nov. 1966 p 5-9 (See N67-12341 03-05) CFSTI: \$4.00

The construction of multichannel diagnostic systems for analyzing physiological states is discussed, considering various procedures and devices for analyzing physiological parameters. Each

physiological parameter characterizes a set of signs expressed in various indices of the electrical signal. The development of a circuit of a universal integrator with a linear scale of measurement within the range of 0 to 100 V is discussed. The integrator is equipped with additional matching elements permitting averaging both of the pulse information (ECG, respiration) and signals of the potential type (O_2 in the blood) or given in the form of functions (EEG, EMG). Complex oscillations of the biopotentials are analyzed with the help of a set of filters each of which passes a narrow band of frequencies. As a result of synthesis of all the circuits of the analyzer, it was concluded that the parameters of the various signals may be measured with a set containing a rectifier, threshold element, flip-flop, kipp relay, filter, and operation amplifier in various switching modes. L. E. W.

N67-12347# Joint Publications Research Service, Washington, D. C.

CUTANO-GALVANIC STIMULATION AS A MEANS OF SUPPLYING INFORMATION TO THE OPERATOR

O. B. Aksenov *In its Rept. on Soviet Res. in the Field of Bionics* 21 Nov. 1966 p 28-31a refs (See N67-12341 03-05) CFSTI: \$4.00

Experiments conducted to examine the possibilities of the tactile channel for supplying information to the human operator are described. The first experiments were concerned with the feelings arising during cutano-galvanic stimulation. It was concluded that electrical stimulation of the skin may provide a sensation of touch at a frequency of 8 cycles for about 1 sec; during stimulation with low frequency (up to 1 cycle) the sense of touch rises with a significant increase in amplitude; at high frequencies the dynamic range of possible stimuli is relatively small; and an important parameter in measuring tactile sensitivity is pulse length. Further experiments, investigating variations in thresholds with time, indicated that repeated cutano-galvanic stimulation with a 10-min interval for 30 min and more leads to stabilization of the tactile threshold of feeling. Tests were also conducted with respect to indication of location of the stimulus; after adjustment of the intensity of the stimulation and 30 min of training the examinee exactly indicated the location of the stimulation in 37% of the cases. L. E. W.

N67-12348# Joint Publications Research Service, Washington, D. C.

AN APPROACH TO THE STUDY OF THE PROCESSES OF FORMATION OF VISUAL IMAGES

I. V. Bushara, O. Ya. Kobrinskaya, and I. B. Muchnik *In its Rept. on Soviet Res. in the Field of Bionics* 21 Nov. 1966 p 32-37 refs (See N67-12341 03-05) CFSTI: \$4.00

Experiments in the simulation of the processes of visual perception, and especially in the formation of visual shapes, are discussed. The hypothesis of compactness is considered, which begins with the assumption that any set of images must have some universal property so that a man with appropriate training can assign the elements of this set to an image. Problems in the

hypothesis are also pointed out. A set of experiments to test the hypothesis is proposed and other experiments, already carried out in the field, are summarized. L.E.W.

N67-12349# Joint Publications Research Service, Washington, D. C.

EXPERIMENTS IN DISCRIMINATION BETWEEN COMPACT SETS OF IMAGES

I. V. Bushara, O. Ya. Kobrinskaya, and I. B. Muchnik *In its Rept. on Soviet Res. in the Field of Bionics* 21 Nov. 1966 p 38-41 (See N67-12341 03-05) CFSTI: \$4.00

Experiments conducted with 12 children (aged 4 to 6) to study the possibility of formation of a generalized representation of a compact set of images are described in detail. The classes of patterns belonged to two different compact sets, and the children were told to separate them into two groups. Fifteen to twenty experiments were conducted with all the examinees; nine learned to separate the pictures without errors, but three did not. It was felt that the results did not determine the role of the property of compactness in the formation of visual patterns; nevertheless, it can be assumed that compactness permits man to form a generalized representation of a practically infinite class of images new to him. L.E.W.

N67-12350# Joint Publications Research Service, Washington, D. C.

ANALYSIS OF THE RESULTS OF EXPERIMENTS IN THE DEVELOPMENT OF DISCRIMINATION OF COMPACT SETS OF IMAGES

I. V. Bushara, O. Ya. Kobrinskaya, and I. B. Muchnik *In its Rept. on Soviet Res. in the Field of Bionics* 21 Nov. 1966 p 42-47 (See N67-12341 03-05) CFSTI: \$4.00

The influence of age characteristics on the development of visual discrimination of compact sets of images was investigated, and a comparative analysis of the results is presented. It was concluded that the decisive factor was not age but rather the degree of development in the examinee of the processes of analysis. It was noted that the examinees poorly trained in mathematics but well trained in foreign languages and the humanities had high indices. All the examinees (117) after some period of training started to correctly distinguish the images. It was felt that the results proved that the compactness of images plays an important role in the processes of formulation of visual discrimination. L.E.W.

N67-12351# Joint Publications Research Service, Washington, D. C.

THE RELATIONSHIP OF THE METRICS OF VISUAL AND AURAL SPACES FOR A PROCEDURE TO CONVERT AN IMAGE INTO A SOUND

V. G. Grishin *In its Rept. on Soviet Res. in the Field of Bionics* 21 Nov. 1966 p 48-53 refs (See N67-12341 03-05) CFSTI: \$4.00

An algorithm for converting images into sound was investigated from the viewpoint of general criteria of the pattern recognition theory, which is not directly related to the psychophysiology of the operator. These criteria are defined as the distance between the classes of patterns and the metric parameters of the classes in an N-dimensional space of signs in which any possible realization of any class is represented by a point. Brightness of the individual points was selected as the signs of initial visual patterns, so that each image corresponds to a point (vector) in the N-dimensional space where N is determined by the difference in detail of the pattern required by the resolution capacity. Equations are formulated, and simplifications of the formula are considered. L.E.W.

N67-12352# Joint Publications Research Service, Washington, D. C.

EVALUATION OF A PROCEDURE FOR CONVERSION OF AN IMAGE INTO SOUND

V. G. Grishin *In its Rept. on Soviet Res. in the Field of Bionics* 21 Nov. 1966 p 54-59 refs (See N67-12341 03-05) CFSTI: \$4.00

The conversion of an image into sound is discussed in relation to expanding the possibilities of the human operator in monitoring control systems and especially in reducing the demands on his vision. A conversion procedure was evaluated, and several conclusions were reached. The analyzing system must have a number of filters corresponding to the number of lines of quantification of the initial image where the characteristic frequencies of the circuits must compare with the carrier frequencies of the transformation. The restrictions of the audible range of frequencies, the restrictiveness of the time of reading the pattern, and the necessity of distinguishing the carrier frequencies lead to the restriction of the allowable number of rows of expansion of the initial image. L.E.W.

N67-12353# Joint Publications Research Service, Washington, D. C.

PROBLEMS IN SIMULATING HUMAN HEARING

Yu. P. Shabanov-Kushnarenko, and G. F. Dyubko *In its Rept. on Soviet Res. in the Field of Bionics* 21 Nov. 1966 p 60-63 refs (See N67-12341 03-05) CFSTI: \$4.00

The mathematical simulation of the functions of human hearing is considered, and the method of the cybernetic black box to simulate hearing on the basis of a study of the psychophysical reactions of the organ of hearing is discussed. It is stated that the input signal $E(t)$ of the hearing organ is the sound oscillogram; the input signal may be an aural sensation considered as a set of sounds H of different pitch or as a subjective sound spectrum varying in time $H(t)$. The problem of finding the algorithm for converting all possible input signals $E(t)$ into output signals $H(t)$ is then considered. An analogy with a vibrating string is used for constructing the model, and the processes that occur in the model are described mathematically. L.E.W.

N67-12354# Joint Publications Research Service, Washington, D. C.

EXPERIMENTS IN CHECKING A MODEL OF VISION IRRADIATION

Yu. P. Shabanov-Kushnarenko *In its Rept. on Soviet Res. in the Field of Bionics* 21 Nov. 1966 p 64-69 refs (See N67-12341 03-05) CFSTI: \$4.00

Analytical relations were obtained for describing the laws of threshold visibility of objects having small angular dimensions. Experiments are described which confirm these relations under the condition that the brightness of the object differs from the brightness of the background by a small magnitude (up to 10 threshold values). The first experiment described consisted of determining the conditions of threshold visibility of a narrow ray band on a white background. The second experiment included the determination of the conditions of comparison of the series made up of 12 grey concentric bands. The third experiment retained the constant width of the period, but varied the width of the grey band. Good correspondence was obtained with the theoretically derived model reactions, and it was concluded that the experiments supported the validity of the mathematical model of vision radiation. L.E.W.

N67-12355# Joint Publications Research Service, Washington, D. C.

SOME PROSPECTS IN FUNCTIONAL SIMULATION OF NERVE ELEMENTS AND SYSTEMS

V. G. Chervov and Yu. P. Bugay *In its Rept. on Soviet Res. in the Field of Bionics* 21 Nov. 1966 p 70-73 refs (See N67-12341 03-05) CFSTI: \$4.00

The construction of mathematical and electronic models of the neuron is discussed, and the mechanisms of excitation and inhibition are considered in detail. It is stated that, in order to create adequate models of the neuron, more neurophysiological

information must be utilized. The parameters of the nerve tissue could be reproduced by comparatively accessible means, if the internal processes of the nerve cell are used as a starting point.
L.E.W.

N67-12356# Joint Publications Research Service, Washington, D. C.

CYCLIC PROCESSES IN THE BIOSPHERE CAUSED BY COSMIC FACTORS AND POSSIBILITIES FOR TAKING THEM INTO ACCOUNT IN PLANNING

P. V. Florenskiy *In its Rept. on Soviet Res. in the Field of Bionics* 21 Nov. 1966 p 74-78 refs (See N67-12341 03-05) CFSTI: \$4.00

Cyclic processes in the biosphere are discussed in relation to planning and economy, particularly in forecasting the relationship of demands and the possibility of obtaining products. The cosmic origin of these variations is discussed, and it is pointed out that by foreseeing the variations it would be possible to forecast such phenomena as the size of harvests, the height of the tides, and the activity of pathogenic organisms. These forecasts could be applied not only to agriculture, but also to industry and public health.
L.E.W.

N67-12357# Joint Publications Research Service, Washington, D. C.

THE BIOELECTRICAL EFFECT OF THE LEAD OF GEOMAGNETIC DISTURBANCES

A. K. Podshibyakin, R. V. Smirnov, R. G. Uzhva, N. P. Adamenko, and V. I. Shakhova *In its Rept. on Soviet Res. in the field of Bionics* 21 Nov. 1966 p 79-84 refs (See N67-12341 03-05) CFSTI: \$4.00

The reactions of live organisms to geomagnetic disturbances and thunderstorms are discussed, and investigations and experiments in this field are summarized. From analysis of the data, it was concluded that almost all people react to geomagnetic disturbances: 20% reacted weakly and appeared insensitive, 60% were definitely sensitive, and 20% were highly sensitive. Some of the geomagnetic effects reported include increased accidents, emergencies, and catastrophes; more complication after operations, especially on the brain; smaller birth activity; and general lowering of the physiological indices of man. The idea is mentioned of using man as a self-predicting bionic system, i.e., using information about his own electric potentials for prognosis of shifts in the geophysical state and applying the information to his working in a man-machine complex.
L.E.W.

N67-12358# Joint Publications Research Service, Washington, D. C.

THE CONSTRUCTION OF MODELS OF NEURON GROUPS

V. I. Bazdyrev and V. G. Chervov *In its Rept. on Soviet Res. in the Field of Bionics* 21 Nov. 1966 p 85-86 (See N67-12341 03-05) CFSTI: \$4.00

Problems involved in constructing and investigating models of neuron groups, which are a combination of neurons executing a determinate function, are discussed. It is pointed out that simulation of neuron groups includes construction of known electrical, logical systems using new elements (neuron models) to create new principles for constructing control systems. Two examples of the application of neuron models in the construction of models of neuron groups are given, i.e., a neuron pulse counter and a neuron impulse oscillator.
L.E.W.

N67-12359# Joint Publications Research Service, Washington, D. C.

A BIONIC MODEL OF COLOR VISION OF MAN AND SOME PROBLEMS IN THE THEORY OF COLOR TELEVISION

Yu. D. Shabanov-Kushnirenko and Ye. P. Putyatin *In its Rept. on Soviet Res. in the Field of Bionics* 21 Nov. 1966 p 87-92 refs (See N67-12341 03-05) CFSTI: \$4.00

A mathematical model of homogeneous standard visual processes was constructed using data obtained from psychophysiology of color vision in man, and the problems related to the isolation of signals with color in the communications channel of a color television are discussed. The following phenomena of color vision are discussed: color irradiation including variation in color sensation with a decrease in the angular dimensions of the observed object, sequential color contrast, simultaneous color contrast, and the Betsold-Bryukke phenomenon, which establishes that color tones of the objects change with variation in their radial brightness. Coefficients of the vision model were defined, and it was found that the basis for selection of the axes I and Q for encoding the color information does not withstand criticism from the viewpoint of the bionic model of vision.
L.E.W.

N67-12360# Joint Publications Research Service, Washington, D. C.

THE USE OF A COMPUTER TO PROCESS INFORMATION OBTAINED FROM ANY POINTS OF ORGANISM CONTROL LOOPS

R. K. Kosinskiy *In its Rept. on Soviet Res. in the Field of Bionics* 21 Nov. 1966 p 93-129 refs (See N67-12341 03-05) CFSTI: \$4.00

Various attempts made to use a computer for analyzing biocurrents of the nervous system are reported, and the development of algorithms for the construction of programs is discussed. On the basis of one of the algorithms, a method for obtaining an autocorrelation function characterizing the frequency composition of the analyzed segment of an EEG was proposed. The use, structure, and capabilities of the algorithm are described in detail.
L.E.W.

N67-12361# Human Factors Research, Inc., Santa Barbara, Calif.
GEOGRAPHIC ORIENTATION IN AIRCRAFT PILOTS: SPEED CONTROL INVERSION

James J. Mc Grath, Paul R. Christensen, and William E. Osterhoff
Jul. 1966 44 p refs
(Contract Nonr-4218(00))
(TR-751-7; AD-638979) CFSTI: HC \$2.00/MF \$0.50

An experiment was conducted to investigate the incidence of inversion errors in the control of airspeed. Sixteen pilots were tested in a laboratory task that required them to make speed control decisions similar to those made during flight for the purpose of achieving a preplanned time of arrival. The results showed that pilots had little difficulty in deciding whether or not a change in speed was necessary, but frequently made errors in deciding which direction to change it. That is, pilots often decided to decrease speed when the correct response was to increase speed, and vice versa. The question of whether or not inversion errors in speed control occur during actual flight is discussed, and some of the factors that may influence the occurrence of such errors are examined.
Author (TAB)

N67-12363# Naval Personnel Research Activity, San Diego, Calif.
AN EVALUATION OF A SHORT FORM OF THE RADIO CODE APTITUDE TEST

Bernard Rimland Aug. 1966 11 p refs
(SRR-67-2; AD-639224) CFSTI: HC \$1.00/MF \$0.50

The radio code aptitude test (RCAT) has been used during and since WWII in the selection of personnel for Morse code training. As a result of recent criticism that the test was too highly speeded toward the end, and was thus hopelessly outpacing and demotivating the testees, an analysis was made of the feasibility of eliminating most of the fast-paced latter items of the RCAT. Statistical analysis of a sample of completed RCAT answer sheets showed the final sixty items (40 per cent) of the RCAT could be eliminated with no loss in psychometric efficiency. The short (60 per cent) form correlated .96 with the long form, and each form had a reliability of .95. Since most items unanswered by the testees were found to have occurred in the final, highly-speeded

40 per cent of the test, it may be assumed that testee frustration will be greatly reduced by the shortened RCAT. It is recommended that items 166 through 225 be omitted from future testing with the radio code aptitude test. A conversion table for obtaining Navy Standard scores from the new short form RCAT is provided. Author (TAB)

N67-12390# Joint Publications Research Service, Washington, D. C.

VESTNIK OF THE USSR ACADEMY OF MEDICAL SCIENCES, VOLUME XXI, NO. 8, 1966

L. K. Khotsyanov et al 25 Nov. 1966 115 p refs Transl. into ENGLISH Vestn. Akad. Med. Nauk SSSR (Moscow), v. 21, no. 8, 1965 p 1-94

(JPRS-38808; TT-66-35232) CFSTI: \$4.00

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17. BOTKIN'S INFECTIOUS HEPATITIS (A SURVEY OF THE PROBLEM) V. M. Zhdanov, A. K. Shubladze, Ye. A. Paktoris, and V. A. Anan'yev p 120-130

18. ON THE IMPORTANCE OF SOIL TYPES AS A FACTOR AFFECTING THE HEALTH OF MAN V. M. Meshchenko p 131-134 refs

N67-12391# Joint Publications Research Service, Washington, D. C.

ADAPTATION OF THE BODY TO TEMPERATURE FLUCTUATIONS

G. Kh. Shakhbazyan and F. M. Shleyfman *In its Vestn. of the USSR Acad. of Med. Sci.* 25 Nov. 1966 p 7-13 refs (See N67-12390 03-04) CFSTI: \$4.00

The problem of marked temperature changes and their effect on human and animal thermoregulatory mechanisms is considered. Adverse effects of body exposure to drastic temperature fluctuations are listed: modifications in the blood serum protein and amino acid-nitrogen concentration, upset protein-forming function of the liver; changes in blood sugar level, and in alkaline reserves; hemodynamic and vascular disturbances and, sometimes, dystrophic alterations in the brain and parenchymatous organs. The mobilization of the organism's defense faculties, and the decline of the thermal resistance in animals, revealed after application of functional loads of the thermoregulatory system, demonstrate that with sharp temperature fluctuations, adaptive forces fail to come into play. R.LI.

N67-12392# Joint Publications Research Service, Washington D. C.

IMPORTANCE OF SPECTROANALYSIS ON ASSESSING THE CHARACTERISTICS OF THE EFFECT OF LOCAL VIBRATIONS ON MAN

I. K. Razumov, N. N. Malinskaya, and E. E. Denisov *In its Vestn. of the USSR Acad. of Med. Sci.* 25 Nov. 1966 p 14-20 refs (See N67-12390 03-04) CFSTI: \$4.00

For industrial application of vibration pathology studies, both the high and low frequency vibrations of manually operated percussion and rotary tools were investigated. Vibragrams were assessed, and it is stated that the vibration spectra change in accordance with the work routine, the form and nature of the product being worked on, as well as the technical condition of the various tools. The use of vibration-protecting devices, consisting of an absorbing spring set between the handle and the body of the tool, is mentioned as a method of reducing adverse effects of vibration. R.LI.

N67-12393# Joint Publications Research Service, Washington, D. C.

EFFECT OF SMALL CONCENTRATION OF CARBON DISULFIDE ON CERTAIN FUNCTIONS AND ORGANS OF ANIMALS

L. M. Kashin *In its Vestn. of the USSR Acad. of Med. Sci.* 25 Nov. 1966 p 21-29 refs (See N67-12390 03-04) CFSTI: \$4.00

To improve industrial conditions for workers subject to carbon disulfide intoxication, experimental results of animal studies were assessed. It was found that carbon disulfide in concentrations of 100 and 100 mg/m³ markedly suppresses the immunological responsiveness of the organism, and that the adrenal cortex function is suppressed. Less significant changes were noted in protein metabolism and blood morphology. It is stated that carbon disulfide produces manifest changes in the organism even at concentrations accepted as maximally permissible, and that consequently such permissible concentrations in the atmosphere of industrial areas must be reduced. R.LI.

N67-12394 Joint Publications Research Service, Washington, D. C.

ON THE NATURE OF THE CARDIOTOXIC EFFECTS OF MERCURY AND ORGANIC MERCURY COMPOUNDS

I. M. Trakhtenberg, G. A. Goncharuk, and V. Ye. Balashov *In its Vestn. of the USSR Acad. of Med. Sci.* 25 Nov. 1966 p 30-40 refs (See N67-12390 03-04) CFSTI: \$4.00

Animal study data analyses were reviewed to determine the cardiotoxic effect of organic mercury compounds, which are active agents in granosan, mercuran, and mercurhexane pesticides. Experimental data indicate that with prolonged toxic exposure, changes occurred in the circulatory function, and limit the capabilities of the cardiovascular system. Details are reviewed on the effect of mercury and its organic compounds on cardiac function, and the evolution of an acute coronary insufficiency against the background of mercury poisoning is described. The mechanism of cardiotoxic action is discussed from the viewpoint of disturbed extracardiac regulation and possible direct effect of the poison upon the myocardium. R.L.I.

N67-12395# Joint Publications Research Service, Washington, D. C.

PHYSIOLOGICAL ASSESSMENT OF ARTIFICIAL ILLUMINATION OF DIFFERENT SPECTRAL COMPOSITION

Z. A. Skobareva *In its Vestn. of the USSR Acad. of Med. Sci.* 25 Nov. 1966 p 41-46 refs (See N67-12390 03-04) CFSTI: \$4.00

For industrial application purposes, the effectiveness of visual work under various types of artificial illumination is assessed. Physiological response to incandescent lamps, luminescent (fluorescent) lamps, and combinations of illuminating and erythemic luminescent lamps were reviewed. The dynamics (contrast and chromatic sensitivity of the eye) during strained visual work under experimental lighting was verified. To perform tasks not requiring color discrimination, luminescent lamps of the white light type, not below 300 lux intensity of illumination, were found most effective. It was also concluded that when ultraviolet radiation of erythemic lamps is combined with sufficient intensity of the luminous flux, the fluorescence of the eye media does not affect the visual function in man. R.L.I.

N67-12396# Joint Publications Research Service, Washington, D. C.

THE EFFECT OF COMBINED ACTION OF DIFFERENT TYPES OF RADIANT ENERGY ON THE BODY'S RESISTANCE TO IONIZING RADIATION

N. F. Galanin, R. S. Mostova, T. A. Sviderskaya, and D. M. Tyukov *In its Vestn. of the USSR Acad. of Med. Sci.* 25 Nov. 1966 p 61-68 refs (See N67-12390 03-04) CFSTI: \$4.00

To increase organism's protection against ionizing radiation, experimental analyses of ultraviolet and infrared radiation on body resistance are reviewed. Experiments on laboratory animals (mice, guinea pigs, and rabbits) indicated central nervous system, as well as immuno-biological, biochemical, and hematological reactions. R.L.I.

N67-12441# Aerospace Medical Div. Arctic Aeromedical Lab., Fort Wainwright, Alaska.

NUTRITIONAL REQUIREMENTS FOR SURVIVAL IN THE COLD AND AT ALTITUDE

Lucile Vaughan ed 1965 395 p refs Proc. of the 5th Symp. on Arctic Biol. and Med. Held in Fort Wainwright, Alaska, 22-24 Mar. 1965: Sponsored by Alaska Univ. (AD-637887) CFSTI: HC \$7.00/MF \$1.75

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1. NUTRITIONAL EFFECTS ON HUMAN PERFORMANCE IN THE COLD K. Rodahl and B. Issekutz, Jr. (Lankenau (Hospital) p 7-47 refs (See N67-12442 03-04)

2. WATER AND CALORIC REQUIREMENTS AS PREDICTED FROM ENVIRONMENTAL CONDITIONS AND PHYSICAL ACTIVITY E. R. Buskirk and L. L. Boyer, Jr. (Pa. State Univ.) p 49-83 refs (See N67-12443 03-04)

3. STUDIES ON PROTEIN METABOLISM IN HARD MUSCULAR WORK IN RELATION TO ITS NUTRITIONAL REQUIREMENT H. Yoshimura (Kyoto Univ.) p 85-120 refs (See N67-12444 03-04)

4. CARBOHYDRATE AND FAT METABOLISM DURING PROLONGED PHYSICAL WORK D. R. Young (NASA, Ames Res. Center) p 121-150 refs (See N67-12445 03-04)

5. BRITISH POLAR EXPEDITIONS--NUTRITIONAL DEVELOPMENTS AND RESEARCH H. E. Lewis (Natl. Inst. for Med. Res.) p 151-164 refs (See N67-12446 03-04)

6. ADAPTATION TO AUSTERE DIETS D. A. Vaughan (Aerospace Med. Div. Arctic Aeromedical Lab.) p 165-194 refs (See N67-12447 03-04)

7. MODIFICATION OF THE WOLFF INTEGRATING MOTOR PNEUMOTACHOGRAPH FOR ARCTIC USE J. C. Klopping (Stanford Univ.) p 195-208 refs (See N67-12448 03-05)

8. A THERAPEUTIC APPROACH TO ARCTIC SURVIVAL RATIONS J. Klopping (Stanford Univ.), T. A. Rogers, J. A. Setliff, and A. C. Buck (Hawaii Univ.) p 209-240 refs (See N67-12449 03-04)

9. SOME ENZYMIC AND CARDIOVASCULAR EFFECTS OF STARVATION-REFEEDING STRESS B. C. Johnson (Ill. Univ.) p 251-297 refs (See N67-12450 03-04)

10. METABOLIC PROBLEMS OF HIGH ALTITUDE L. C. G. E. Pugh (Med. Res. Council) p 299-341 refs (See N67-12451 03-04)

11. NUTRITION AND FLUID BALANCE IN HIGH ALTITUDE MOUNTAINEERING T. O. Nevison, Jr., J. E. Roberts, and W. W. Lackey (Lovelace Foundation for Med. Education and Res.) p 343-363 refs (See N67-12452 03-04)

N67-12442# Lankenau Hospital, Philadelphia, Pa. Div. of Research.

NUTRITIONAL EFFECTS ON HUMAN PERFORMANCE IN THE COLD

Kaare Rodahl and Bela Issekutz, Jr. *In Aerospace Med. Div. AAL Nutritional Requirements for Survival in the Cold and at Altitude 1965* p 7-47 refs (See N67-12441 03-04) CFSTI: HC \$7.00/MF \$1.75

A discussion is presented of the nutritional effects on human performance at normal room temperature, in clothed individuals habitually exposed to a cold environment, and in nude individuals exposed to extreme cold. Various experiments are cited, and graphs and tables are given which show performance, caloric intake, and oxygen intake as functions of time and temperature. C.T.C.

N67-12443# Pennsylvania State Univ., University Park. Dept. of Architectural Engineering.

WATER AND CALORIC REQUIREMENTS AS PREDICTED FROM ENVIRONMENTAL CONDITIONS AND PHYSICAL ACTIVITY

E. R. Buskirk and L. L. Boyer, Jr. *In Aerospace Med. Div. AAL Nutritional Requirements for Survival in the Cold and at Altitude 1965* p 49-83 refs (See N67-12441 CFSTI: HC \$7.00/MF \$1.75

Specific mathematical and graphical expressions that describe man's requirements for water, oxygen, and food in any terrestrial environment are presented. The mathematical model consists of a 12-term polynomial equation wherein the requirement for water, oxygen, or food is the dependent variable, and activity level and thermal environment are two independent variables treated as

single indices. A standard man is defined with respect to age, weight, sex, clothing, and acclimatization, so that influences of these variables would remain constant. Activity level is represented by body heat production, and the environment is defined in terms of a comfort mark rating. C.T.C.

N67-12444# Kyoto Univ. Japan. Dept. of Physiology.
STUDIES ON PROTEIN METABOLISM IN HARD MUSCULAR WORK IN RELATION TO ITS NUTRITIONAL REQUIREMENT

Hisato Yoshimura *In* Aerospace Med. Div. AAL Nutritional Requirements for Survival in the Cold and at Altitude 1965 p 85-120 refs (See N67-12441 03-04) CFSTI: HC \$7.00/MF \$1.75

A lecture is presented on the mechanism of anemia which appears during the course of strenuous training. The destruction of erythrocytes in strenuous muscular exercise is explained as due to one of the stress reactions to heavy muscular work. Results from several experiments are shown to support this hypothesis. It was verified that the erythrocyte thus destroyed is utilized to promote the hypertrophy of skeletal and heart muscle and also the regeneration of new erythrocytes. The anemia due to the increased destruction of erythrocytes can be prevented by providing a large amount of dietary protein, an amount sufficient to promote the erythrocyte regeneration covering its destruction. A discussion period following the lecture is also included. A.G.O.

N67-12445# National Aeronautics and Space Administration. Ames Research Center. Moffett Field, Calif.
CARBOHYDRATE AND FAT METABOLISM DURING PROLONGED PHYSICAL WORK

Donald R. Young *In* Aerospace Med. Div. AAL Nutritional Requirements for Survival in the Cold and at Altitude 1965 p 121-150 refs (See N67-12441 03-04) CFSTI: HC \$7.00/MF \$1.75

A discussion is given of experiments and research efforts concerned with determining the requirements and composition of survival rations. In general it was found that experiments do not confirm the carbohydrate theory of fatigue. With dogs and human subjects, physical exhaustion was not conclusively related to the observed variations in blood sugar during treadmill tests. In the absence of a major limitation of water supply, a requirement for adequate carbohydrate nutrition appears to be more closely related to the prevention of ketosis than to the maintenance of the blood sugar level. However, since the ketosis of starvation is only transitory, it is likely that biological adaptations do occur which result in the improved utilization of fat. C.T.C.

N67-12446# National Inst. for Medical Research, London, (England). Div. of Human Physiology.
BRITISH POLAR EXPEDITIONS--NUTRITIONAL DEVELOPMENTS AND RESEARCH

Harold E. Lewis *In* Aerospace Med. Div. AAL Nutritional Requirements for Survival in the Cold and at Altitude 1965 p 151-164 refs (See N67-12441 03-04) CFSTI: HC \$7.00/MF \$1.75

A review is presented of work accomplishments in polar physiology, with emphasis placed on nutritional aspects. Various experiments are discussed in which measurements were made of such parameters as caloric intake, body temperatures, and physiological effects. C.T.C.

N67-12447# Aerospace Medical Div. Arctic Aeromedical Lab., Fort Wainwright, Alaska.
ADAPTATION TO AUSTERE DIETS

David A. Vaughan *In* its Nutritional Requirements for Survival in the Cold and at Altitude 1965 p 165-194 refs (See N67-12441 03-04) CFSTI: HC \$7.00/MF \$1.75

A discussion is presented of three experiments that have been conducted with respect to austere diets and survival rations of various kinds. The first experiment consisted of a simulated survival test of pemmican, a 3-ounce meat food bar which consists of dehydrated lean ground beef and pork bound together with beef fat. The second experiment was conducted to check earlier results and to test the effect of a larger supplement of sugar. The third experiment was designed to prove whether or not a difference in dietary composition during one episode of caloric restriction would have an effect on responses during a succeeding episode of caloric restriction. Results and conclusions of these experiments are given along with a discussion of various tables and graphs. C.T.C.

N67-12448# Stanford Univ., Calif. Dept. of Radiology
MODIFICATION OF THE WOLFE INTEGRATING MOTOR PNEUMOTACHOGRAPH FOR ARCTIC USE

John C. Klopping *In* Aerospace Med. Div. AAL Nutritional Requirements for Survival in the Cold and at Altitude 1965 p 195-208 refs (See N67-12441 03-04) CFSTI: HC \$7.00/MF \$1.75

(Contract AF 41(657)-364)

Modifications to prevent freezing in arctic temperatures are reported for the pneumotachograph, an instrument for measuring the energy expended by man over long periods. C.T.C.

N67-12449# Hawaii Univ., Honolulu. Pacific Biomedical Research Center.

A THERAPEUTIC APPROACH TO ARCTIC SURVIVAL RATIONS

Terence A. Rogers, James A. Setliff, Alan C. Buck, and John Klopping (Stanford Univ) *In* Aerospace Med. Div. AAL Nutritional Requirements for Survival in the Cold and at Altitude 1965 p 209-249 refs (See N67-12441 03-04) CFSTI: HC \$7.00/MF \$1.75

The problems of an arctic survival situation arising from an aircraft emergency are considered under the main categories of clothing and shelter, starvation, and psychological stress. Experiments were directed toward studying the "clinical course" of a simulated survival situation, and to the possibility of minimizing the metabolic derangements in order to improve the physical performance of a survivor. C.T.C.

N67-12450# Illinois Univ., Urbana. Dept. of Animal Science.
SOME ENZYMATIC AND CARDIOVASCULAR EFFECTS OF STARVATION-REFEEDING STRESS

B. Connor Johnson *In* Aerospace Med. Div. AAL Nutritional Requirements for Survival in the Cold and the Altitude 1965 p 251-297 refs (See N67-12441 03-04) CFSTI: HC \$7.00/MF \$1.75

Experimental studies are reported in (1) the cardiovascular effects of refeeding stress following long periods of starvation in swine and (2) the induction of certain enzymes of glucose metabolism by diet following starvation in rats. In the first area electrocardiograms from standard and augmented limb leads were recorded. Severe stresses upon the cardiovascular system were produced as a result of unrestricted initial refeeding, particularly with glucose alone or with a diet high in glucose. Histological damage of apparently irreversible nature was produced in the myocardium, arteries, and arterioles. Notable diastolic hypertension was evident after two starvation-refeeding episodes and persisted following the fourth episode. Using rats as the experimental animals, the enzymes glukokinase, isocitrate dehydrogenase, and glucose-6-phosphate dehydrogenase were assayed in the diver during various types of starvation and refeeding procedures. It was found that all three enzyme levels were depressed during either total or

protein starvation. Upon refeeding a complete ration after total starvation, glucose-6-phosphate dehydrogenase increased to levels four to five times normal within 72-hours and then gradually return to normal. C.T.C.

N67-12451# Medical Research Council, London (England).
METABOLIC PROBLEMS OF HIGH ALTITUDE OPERATIONS

L. C. G. E. Pugh *In* Aerospace Med. Div. AAL Nutritional Requirements for Survival in the Cold and at Altitude 1965 p 299-341 refs (See N67-12441 03-04) CFSTI: HC \$7.00/MF \$1.75

Some of the problems of feeding men at high altitudes are discussed, with emphasis placed on results of Himalayan expeditions. It is shown that men at high altitudes need a lot of carbohydrate and they tolerate far more sugar than they can at sea level. It was found that they have a reciprocal distaste for fats, and that the importance of adequate caloric and fluid intake should be rated at least as high as that of oxygen. C.T.C.

N67-12452# Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex.
NUTRITION AND FLUID BALANCE IN HIGH ALTITUDE MOUNTAINEERING

Thomas O. Nevison, Jr., James E. Roberts, and William W. Lackey *In* Aerospace Med. AAL Nutritional Requirements for Survival in the Cold and at Altitude 1965 p 343-363 refs (See N67-12441 03-04) CFSTI: HC \$7.00/MF \$1.75

Nutrition and fluid requirements, two important aspects of high altitude mountaineering, are considered in view of their relationship to arctic survival. Measurements and findings of various expeditions are discussed and the results are given in tabular form. It is concluded that the best approach to very high altitude climbing is to minimize the stay at extreme altitudes, and to complete the climb before any major deterioration occurs as a result of combined hypoxia, exposure, near-starvation, and dehydration. An observed tendency for an increase in the rate of water exchange at altitude was found consistent with the known increase in respiratory water loss due to increased ventilation at altitude. The same danger exists in an arctic situation in which there are active subjects. C.T.C.

N67-12472# Aeronautical Research Labs., Melbourne (Australia).
THE INDIRECT MEASUREMENT OF TASK DIFFICULTY
Human Engineering Report No. 4

E. Linden Hilgendorf Oct. 1965 30 p refs
(ARL/HE-4) CFSTI: HC \$2.00/MF \$0.50

The four experiments are concerned with the development of a technique for the measurement of complex and skilled tasks in terms of information theory. Performance on a key pressing task of varied information input was related to the spare mental capacity of the operator by measuring his performance on a secondary task. It was found that a sensory threshold task was unsuitable for this purpose but that a secondary attention task was lawfully related to information input on the primary task. It appears that a secondary task which is suitable for the measurement of spare mental capacity must satisfy several specified criteria. Author

N67-12492# School of Aerospace Medicine, Brooks AFB, Tex.
PHYSIOLOGIC EFFECTS OF AN 18-HOUR FLIGHT IN F-4C AIRCRAFT

Edward F. Kramer, Jr., Henry B. Hale, and Edgar W. Williams Jun. 1966 15 p refs

(SAM-TR-66-59; AD-636911) CFSTI: HC \$1.00/MF \$0.50

Physiologic assessment was performed by means of postflight urinalysis for 8 pilots who flew F-4C aircraft for 18 hours. Flight effects were neither numerous nor of largemagnitude, nor were the pilots unduly fatigued. The flight-induced, physiologic changes included: (1) increased 17-hydroxycorticosteroid excretion, which

implies adrenocortical stimulation, and (2) decreased excretion of uric acid, potassium, and irine, which suggests metabolic depression. Author

N67-12494# Library of Congress, Washington, D. C. Aerospace Technology Div.

SOVIET HIGH-ALTITUDE EQUIPMENT FOR AIRCREW PROTECTION Surveys of Foreign Scientific and Technical Literature

Daniel M. Pyle and Janice Smith 9 Jun. 1966 86 p refs
Special extended abstract and transl. (ATD-66-67)

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1. G-SUITS, PRESSURE SUITS AND PROTECTIVE HELMETS. ACCELERATIONS DURING PARACHUTE JUMPS S. refs (See N67-12495 03-05)

2. PROTECTIVE EQUIPMENT FOR HIGH-ALTITUDE FLIGHTS S. P. Umanskiy p 45-51 (See N67-12496 03-05)

3. PRESSURIZED CABINS M. F. Rebrov p 52-62 (See N67-12497 03-05)

4. HIGH ALTITUDE INSTRUMENTATION AND EQUIPMENT FAILURE I. G. Rabkin p 63-65 (See N67-12498 03-05)

5. HERMETICALLY SEALED HULL COMPARTMENTS AND METHODS OF CALCULATING THEIR STRENGTH B. L. Bel'skiy, I. P. Vlasov, V. N. Zaytsev, S. N. Kan, V. P. Karnozhitskiy et al p 66-72 (See N67-12499 03-02)

6. HIGH ALTITUDE EQUIPMENT Ye. V. Sofronov p 73-75 (See N67-12500 03-02)

N67-12495# Library of Congress, Washington, D. C. Aerospace Technology Div.

G-SUITS, PRESSURE SUITS AND PROTECTIVE HELMETS. ACCELERATIONS DURING PARACHUTE JUMPS

S. P. Umanskiy *In its* Soviet High-altitude Equipment for Aircrew Protec. 9 Jun. 1966 p 1-44 refs Transl. into ENGLISH of chap. 4 and 5 from the book "Bar'yer Vynoslivosti Letchika" Moscow, Izd-vo "Mashinost." (See N67-12494 03-05)

General information is presented on the protective gear and devices designed to safeguard the pilot from acceleration during flight or during ejection. The development of G-suits with multiple bladders and pressure suits with constricting mechanisms is traced, and the main physiological effects of each are discussed. Construction of each type is detailed; schematic representations are included. The main components of protective aviation helmets are examined, the strength characteristics of typical helmet materials are compared, and the relative merits of the various types are assessed. Accelerations during emergency escape are considered in relation to parachute jumps and ejection devices. Design details are given, with emphasis focused on the ejection mechanisms necessitated by high speed aircraft. Also discussed are pilot exposure to acceleration during firing, windblast, airstream deceleration, negative lift, and angular acceleration; their effects on the human body; and the protection which the various devices afford. M.G.J.

N67-12496# Library of Congress, Washington, D. C. Aerospace Technology Div.

PROTECTIVE EQUIPMENT FOR HIGH-ALTITUDE FLIGHTS

S. P. Umanskiy *In its* Soviet High-altitude Equipment for Aircrew Protec. 9 Jun. 1966 p 45-51 Transl. into ENGLISH from Vestn. Vozdushnogo Flota (USSR), no. 4, 1958 p 64-68 (See N67-12494 03-05)

The problems of maintaining the normal vital activities of the human body during high altitude flights are considered in relation to the various solutions which have been devised. The conditions causing oxygen insufficiency are examined, along with the physiological changes which such insufficiencies induce. The use of pressurized cabins and of stationary oxygen installations is discussed, and details are given on the various oxygen mask

designs, the altitude compensating or pressure suits, and the pressurized high altitude suits. M.G.J.

N67-12497# Library of Congress, Washington, D. C. Aerospace Technology Div.

PRESSURIZED CABINS

M. F. Rebrov *In its Soviet High-altitude Equipment for Aircrew Protec.* 9 Jun. 1966 p 52-62 Transl. into ENGLISH from "Chto Delayut Avtomaty na Samolete" Moscow, Voenizdat, 1960 p 119-131 (See N67-12494 03-05)

Details are given on a ventilation-type pressurized cabin, in which air is supplied by the engine compressor at altitudes above 2000 to 2500 m. A schematic diagram showing the automatic equipment which comprises the system is included, and the function of each is briefly described. These include the compressor, automatic air feed regulator, check valve, heat exchanger, atmospheric air collector, humidity regulator and indicator, filter, flow meter sensor, manual pressure control valve, air outlets, pressure regulator, altitude and pressure drop indicator, pressure loss alarm, external check valve, air duct system, emergency pressure venting valve, thermostat, flow meter indicator, and altitude signal. Also described are the various types of oxygen equipment carried for emergency use, such as oxygen apparatus with intermittent feed, and a device for creating excess pressure in oxygen masks. The protection afforded by an altitude compensating suit is assessed. M.G.J.

N67-12498# Library of Congress, Washington, D. C. Aerospace Technology Div.

HIGH-ALTITUDE INSTRUMENTATION AND EQUIPMENT FAILURE

I. G. Rabkin *In its Soviet High-altitude Equipment for Aircrew Protec.* 9 Jun. 1966 p 63-65 Transl. into ENGLISH from "Bezopasnosti Poletov" Moscow, Voenizdat, 1962 p 88-91 (See N67-12494 03-05)

Instrument detection of depressurization or oxygen failure in a ventilation-type pressurized cabin is described, and the steps which must be taken to minimize the danger of hypoxia are discussed. The recommended sequence consists of switching on the emergency oxygen supply system, or switching over to feeding from the parachute device; a quick descent to a safe flight altitude (4000 m); and ascertaining that the system valve is completely open and that the air intake lever is correctly set. For stratospheric flights, high altitude equipment includes the parachute oxygen device, a pressurized helmet, and a pressurized flying suit. Speed in switching over to the oxygen supply is emphasized, as the reserve time during which a person can maintain efficiency without oxygen at 16,000 to 20,000 m is estimated at 8 to 10 seconds. A strong recommendation is made for preflight adjustment of all high altitude equipment. M.G.J.

N67-12531# University Coll., Galway (Ireland). Dept. of Biochemistry.

BILIPROTEINS OF ALGAE

Colm Oheocha Repr. from *Ann. Rev. Plant Physiol.*, v. 16, 1965 p 415-434 refs

(Grant AF-EOAR-63-18)

(AFOSR-66-1127; AD-637623)

Recent advances in biliprotein chemistry are reviewed. Topics include: Phycoerythrins, Phycocyanins, Phycobilins. Chemical Composition, Phycobilin-protein interactions.

Author (TAB)

N67-12641*# Harvard School of Public Health, Boston, Mass. **STUDY OF SPACE CABIN ATMOSPHERES** Status Report, 1 Jan.-30 Jun. 1966

William A. Burgess and Parker Cramer Reist 30 Sep. 1966 27 p refs

(Grant NGR-22-007-053)

(NASA-CR-79538) CFSTI: HC \$2.00/MF \$0.50 CSCL 06K

CONTENTS:

1. SIZE DISTRIBUTION SAMPLING ERRORS INTRODUCED BY THE POINT-PLANE ELECTROSTATIC PRECIPITATOR SAMPLING DEVICE P. C. Reist 19 p refs (See N67-12642 03-05)

N67-12642*# Harvard School of Public Health, Boston, Mass. Dept. of Industrial Hygiene.

SIZE DISTRIBUTION SAMPLING ERRORS INTRODUCED BY THE POINT-PLANE ELECTROSTATIC PRECIPITATOR SAMPLING DEVICE

Parker Cramer Reist *In its Study of Space Cabin Atmospheres* 30 Sep. 1966 19 p refs (See N67-12641 03-05) CFSTI: HC \$2.00/MF \$0.50

In using the point plane electrostatic precipitator it is generally assumed that the size distribution of the sample collected represents reasonably well the actual particle size distribution of the test aerosol. This paper reports an investigation made to determine the accuracy of this assumption and concludes that for count size distributions the error introduced by this sampling device is insignificant. Author

N67-12670# Naval Research Lab., Washington, D. C. **METHOD FOR ON-SITE DETERMINATION OF RESIDUAL ADSORPTIVE CAPACITY OF CHARCOALS USED IN CLOSED ENVIRONMENTAL SYSTEMS**

D. L. Venezky and W. B. Moniz 31 Aug. 1966 21 p refs

(NRL-MEMO-1710; AD-639145) CFSTI: HC \$1.00/MF \$0.50

The relationship between the moisture content of adsorbent-type charcoals and their residual adsorptive capacity for organic compounds was studied. Investigation of fourteen charcoal samples from submarine main-carbon filters has shown that the moisture content of the charcoals correlates with the organic loading previously determined by a steam desorption method. A simple apparatus for determining the moisture content of a charcoal sample was devised. The on-site determination of the residual adsorptive capacity of main-filter charcoals is suggested by the low cost of the closed-loop apparatus and the simplicity of the method. Since seventy percent of the charcoal samples which were investigated had more than half of their adsorptive capacity remaining, substantial savings should result. TA

N67-12671# Aerospace Medical Div. Aerospace Medical Research Labs. (6570th), Wright-Patterson AFB, Ohio.

MECHANICAL IMPEDANCE AS A TOOL IN BIOMECHANICS Final Report, Jul. 1963-Jul. 1964

Edmund B. Weis, Jr., Neville P. Clarke, and Henning E. Von Gierke Jun. 1966 30 p refs

(AMRL-TR-66-84; AD-638792) CFSTI: HC \$2.00/MF \$0.50

The report presents new measurements of mechanical impedance in the transient acceleration environment and compares the results with previous measurements made in the steady state sinusoidal acceleration environment. Although there are some discrepancies which await further clarification, the transfer function obtained under these two environments show encouraging general correlation. With further sophistication of the method, the transient impedance measurement shows considerable potential in that a single test furnishes data over a spectrum of frequencies and provides a more general excitation condition. Although it has only been recently employed for this purpose, the practical usefulness of the impedance method as a means of establishing design criteria for protection systems is most encouraging. With further definition of the mechanodynamic properties of the body of protection system components, it appears reasonable that biomechanics can achieve the goal of providing optimized protection against the increasingly severe mechanical environments generated in aerospace vehicles and ground-transportation. Author (TAB)

N67-12696# Joint Publications Research Service, Washington, D. C.

THE PHYSICO-CHEMICAL MODELING OF INFORMATION AND THOUGHT PROCESSES

N. I. Kobozev 22 Nov. 1966 44 p refs Transl. into ENGLISH from Zh. Fiz. Khim. (Moscow), v. 40, no. 2, 4, Feb.-Apr. 1966 (JPRS-38760; TT-66-35184) CFSTI: \$2.00

CONTENTS:

1. THE PHYSICO-CHEMICAL MODELING OF INFORMATION AND THOUGHT PROCESSES I: THERMODYNAMICS OF INFORMATION PROCESSES N. I. Kobozev p 1-23 refs (See N67-12697 03-05)

2. THE PHYSICO-CHEMICAL MODELING OF INFORMATION AND THOUGHT PROCESSES II: THERMODYNAMICS OF THOUGHT PROCESSES N. I. Kobozev p 24-40 refs (See N67-12698 03-05)

N67-12697# Joint Publications Research Service, Washington, D. C.

THE PHYSICO-CHEMICAL MODELING OF INFORMATION AND THOUGHT PROCESSES. I: THERMODYNAMICS OF INFORMATION PROCESSES

N. I. Kobozev *in its* The Physico-Chem. Modeling of Inform. and Thought Processes 22 Nov 1966 p 1-23 refs (See N67-12696 03-05) CFSTI: \$2.00

The applicability of physical chemistry in the development of thermodynamical information models is illustrated using an ideal gas consisting of identical and immutable particle-chances compressed within a single cell. It is shown that, on the basis of this model, the realization of the information process at the molecular level is thermodynamically permissible and does not require conditions which could not be physically satisfied for molecular systems. The transition to the chemical thermodynamics is associated with the change in number and kind of the originally introduced particle-chance and represents an essential extension of the thermodynamical information model to a more general case. This generalization leads directly to the thermodynamics of thinking.

S.C.W.

N67-12698# Joint Publications Research Service, Washington, D. C.

THE PHYSICO-CHEMICAL MODELING OF INFORMATION AND THOUGHT PROCESSES II: THERMODYNAMICS OF THOUGHT PROCESSES

N. I. Kobozev *in its* The Physico-Chem. Modeling of Inform. and Thought Processes 22 Nov. 1966 p 24-40 refs (See N67-12696 03-05) CFSTI: \$2.00

A thermodynamical model of logical thinking is derived in an attempt to establish those physico-chemical conditions which must be satisfied by the molecular mechanisms of thinking. Basic differences between the processes involved in the thermodynamical modeling of information and thinking are analyzed. Results of this investigation are as follows: (1) Information can be thermodynamically derived from thinking as its specific and simplest entropy form capable of being realized by molecular mechanisms; an inverse event cannot take place. (2) The condition that the given problem appears as a logical rather than an information one is the thermodynamical relationship $J_{Wien} < < \Delta \phi^\circ > > 0$ and, correspondingly, $L > 0$. (3) The transition to the rigorously logical single-valued thinking corresponds to the transition to the limiting thermodynamical conditions $T=0$ and $H_k=0$, which corresponds to a complete freeing of the thought process from the molecular statistics. (4) Thinking cannot be materialized by means of ordinary molecular mechanisms, but must be necessarily connected with special mechanisms and special particles which are not obeying molecular statistics and may achieve the entropyless status without the temperature condition $T=0$.

S.C.W.

N67-12721# National Academy of Sciences-National Research Council, Washington, D. C.

EXTRATERRESTRIAL LIFE: AN ANTHOLOGY AND BIBLIOGRAPHY

Elie A. Shneour (Utah Univ.) and Eric A. Ottesen, comp. 1966 497 p refs (NAS-NRC-1296A) Available from NAS-NRC, Washington, D. C.: \$6.00

Articles and bibliography on the origins and evolution of terrestrial and extraterrestrial life and on Mariner IV and sounding rocket observations of Mars are presented. For individual titles see N67-12722-N67-12756.

N67-12722# Carnegie Institution of Washington, D. C.

GEOCHEMISTRY OF ORGANIC SUBSTANCES

Philip H. Abelson *In* NAS-NRC Extraterrest. Life 1966 p 3-28 refs Reprinted (See N67-12721 03-04) Available from NAS-NRC, Washington, D. C.: \$6.00

Some occurrences of organic substances in nature, their fate in geologic environments, and their thermal stability and reaction with other molecules are discussed. Temperature-time curves are plotted to show degradation of straight-chain hydrocarbons and porphyrins, as well as the oxidation of organic substances by oxygen in ground water. A comparison is made of recent and an Oligocene mud, and the principal amino acids in recent and Oligocene sediments are tabulated. Amino acids in fossils are discussed; and tables show their content in recent tropical calcium carbonate shells, and contents in various fossils from different geographical areas. Some hydrocarbons isolated from gas-oil fractions of Ordovician crude are tabulated; lipides, carbohydrates, and porphyrins in geological environments are considered; and Precambrian occurrences are discussed.

M.W.R.

N67-12723# Chicago Univ., Ill.

OBSERVATIONS ON THE NATURE OF THE "ORGANIZED ELEMENTS" IN CARBONACEOUS CHONDRITES

Frank W. Fitch and Edward Anders *In* NAS-NRC Extraterrest. Life 1966 p 29-47 refs Sponsored in part by AEC Reprinted (See N67-12721 03-04) Available from NAS-NRC, Washington, D. C.: \$6.00

On the basis of a previous tabulation of the organized elements in Class I carbonaceous chondrites, a study was made to confirm and further characterize the composition of such elements. Samples of the carbonaceous chondrites, Orgueil and Ivuna, were examined by conventional brightfield, phase contrast, and fluorescence microscopy; as well as by biological staining, X-ray diffraction, and electron microprobe analysis. Microscopic observations, fluorescence in ultraviolet light, biological stains, treatment with hydrofluoric acid are discussed; as are the attempts at identification, with special attention to organized elements embedded in mineral veins in thin sections. Differences between Claus and Nagy and the present authors are mentioned, and it is concluded that the present evidence is inadequate to suggest a biological origin for the indigenous particles. Some of the features which make it difficult to accept the highly structured particles as extraterrestrial in origin are their absence in the thin sections of the chondrites and their morphological resemblance to common airborne contaminants.

M.W.R.

N67-12724# Miami Univ., Coral Gables, Fla. Inst. of Molecular Evolution.

HOW DID LIFE BEGIN?

Sidney W. Fox *In* NAS-NRC Extraterrest. Life 1966 p 48-64 refs Reprinted *Its* Fla State Univ. Oceanog. Inst. Contrib. No. 130 (See N67-12721 03-04) Available from NAS-NRC, Washington, D. C.: \$6.00

(Grants NSF G-4566; NIH C-3971)

Amino acid and proteinoid production are discussed in relation to the beginnings of life, and it is noted that there are proteins which possess all the properties of proteinoids, with the exception of the nonantigenicity. Due to variation in proteins, exact comparisons present some difficulties. Several laboratories are concerned with evidence in which isolated chemical aspects of life might have arisen spontaneously. One experimental program and theory, predominantly thermal, has connected parts of each of the five stages of prelife in a continuum that proposes many living phenomena as inexorable consequences of preceding phenomena. Based largely on thermal experiments, a postulated first cycle leading to life, its reproduction, and mutation is diagrammed. Inferences which follow are (1) spontaneous generation of biochemical pathways, including production of amino acids and nucleic acid intermediates, (2) origin of protein in intimate relationship in the same reaction mixtures, and (3) spontaneous separation into preliving units and environment when the system became aqueous. Viruses and unified outline theories are discussed, with some attention to the germ theory of the origin of life. M.W.R.

N67-12725# California Univ., Berkeley.

REDUCTION OF CARBON DIOXIDE IN AQUEOUS SOLUTION BY IONIZING RADIATION

W. M. Garrison, D. C. Morrison, J. G. Hamilton, A. A. Benson, and Melvin Calvin *In* NAS-NRC Extraterrest. Life 1966 p 65-69 refs Reprinted Sponsored by AEC (See N67-12721 03-04) Available from NAS-NRC, Washington, D. C.: \$6.00

Consideration is given to the origin of an organic milieu in the absence of any life at all. One source of reduced carbon compounds in complex arrangements might have been the interaction of various high energy radiations with aqueous solutions of inorganic materials. There are conditions under which these ionizing radiations could induce carbon dioxide reduction with water, resulting in the ultimate creation of polyatomic molecules, other than simple polymerization of monomers of carbon, oxygen, hydrogen, and nitrogen. Results are summarized for data obtained by the bombardment of air-free aqueous solution of C¹⁴-labeled CO₂ in a closed system with and without ferrous sulfate. These indicate that appreciable quantities of carbon dioxide can be reduced to formic acid; but whether the formic acid is further reduced to formaldehyde or whether the formaldehyde arises during the reduction has yet to be determined. The actual ion-pair yield is not optimal; and, presumably, reduction is achieved via the secondary hydrogen atoms resulting from the ionization. M.W.R.

N67-12726# Indian Statistical Inst., Calcutta.

THE ORIGINS OF LIFE

J. B. S. Haldane *In* NAS-NRC Extraterrest. Life 1966 p 70-80 refs Reprinted (See N67-12721 03-04) Available from NAS-NRC, Washington, D. C.: \$6.00

The problem of describing the origin of life is considered akin to the origin itself in that a number of attempts were made and almost all of them did not work. Natural selection eliminated many of the attempts with regard to the actual origin, and present-day speculations about the origins have the advantages of the "mistakes" of the many theories that have already been advanced. In summary, it is hypothesized that metastable organic compounds were formed by the action of solar radiation on the atmosphere before it contained much free oxygen. Catalytically active molecules, possibly like adenosinetriphosphoric acid, could increase their own number while breaking down the new organic compounds that came into being. The critical event that may be best called the origin of life was the enclosure of several different self-producing polymers with a semipermeable membrane. The origin of photosynthesis, anaerobic life, lifelike molecules, and other aspects of the evolution of living matter are treated. M.W.R.

N67-12728# California Inst. of Tech., Pasadena.

ON THE EVOLUTION OF BIOCHEMICAL SYNTHESSES

Norman H. Horowitz *In* NAS-NRC Extraterrest. Life 1966 p 82-86 refs Reprinted (See N67-12721 03-04) Available from NAS-NRC, Washington, D. C.: \$6.00

A hypothesis suggests that the first living entity was a completely heterotropic unit that could reproduce at the expense of prefabricated organic molecules in its environment. When the supply of specific substrates limited further multiplication, a mutation-type process utilized other available substances. Further evolution probably occurred through the chance combination of certain genes, and short reaction chains were developed which utilized substances that had previously been synthesized. It is noted that there are presently seven different genes concerned with the synthesis of arginine; and the inactivation of any one of these prevents synthesis. Two of the intermediates in the chain are identified as amino acids, ornithine and citrulline. Unlike arginine, neither of these is a general constituent of proteins; and, aside from their function as precursors, they are apparently of no further use to the organism. A model proves a means for the evolution of a new gene combination despite unfavorable mutation rates to active alleles. M.W.R.

N67-12729# Northwestern Univ., Evanston, Ill. Dearborn Observatory.

OCCURRENCE OF LIFE IN THE UNIVERSE

Su-Shu Huang *In* NAS-NRC Extraterrest. Life 1966 p 87-93 refs Reprinted (See N67-12721 03-04) Available from NAS-NRC, Washington, D. C.: \$6.00

Knowledge of stars and their evolution is used to discuss the requirements for life, especially in an advanced form. Time-scales of biological and stellar evolution are discussed, along with the habitable zone of a star and the dynamical and physical considerations which might hinder the development of life. Dynamically, a planet around one component of a binary or multiple system is always perturbed by its companions; and its chances of remaining within a habitable zone are greatly reduced. Further, if either component of a close binary system is of an early type, no life can be expected. The question is posed as to whether the orbit of a star around the galactic center has any bearing on the life-supporting property of its planets. The exact percentage of stars that actually support life is considered to depend upon the mode of star and planet formation; and, therefore, cannot be estimated objectively. It is concluded that there are no expectations of any well-evolved life on any of the planets of alpha Centauri. M.W.R.

N67-12730# Joint Publications Research Service, Washington, D. C.

OUTER SPACE AND LIFE

A. A. Imshenetsky *In* NAS-NRC Extraterrest. Life 1966 p 94-101 refs Transl. into ENGLISH from Vestn. Akad. Nauk SSSR (Moscow), v. 33, 1963 p 23-29 Reprinted (See N67-12721 03-04) Available from NAS-NRC, Washington, D. C.: \$6.00 (JPRS-22015; TT-63-41224)

Microbiological analysis of meteorites, detection of life at high altitudes, and life on other planets and outer space are discussed in terms of designing possible experiments. The search for microorganisms on other planets should be in three phases: (1) Detection of heterotrophic bacteria by establishing conditions whereby large numbers of species can reproduce by using organic matter. (2) Search for chemoautotrophic microorganisms which oxidize hydrogen, methane, ammonia, sulfur, iron and other compounds. (3) Search for bacteria which carry out anaerobic photosynthesis. Nephelometry, manometry, and pH determination are discussed as approaches for recording cell division; and extreme conditions which might be found in space are noted. M.W.R.

N67-12732# Stanford Univ., Calif.

EXOBIOLGY: APPROACHES TO LIFE BEYOND THE EARTH

Joshua Lederberg /in NAS-NRC Extraterrest. Life 1966 p Reprinted (See N67-12721 03-04)

Available from NAS-NRC, Washington, D. C.: \$6.00

Various theories related to the origin of life are discussed, and motivations for exobiological research are treated. In terms of evolving a definition of life, one of the main objectives of exobiological studies is to compare the overall patterns of chemical evolution of the planets. Natural and artificial panspermia and the migration of spores from one planet to another are considered; and planetary targets for research are mentioned. Experimental approaches that are considered feasible are discussed, and the conservation of natural resources beyond the earth is treated.

M.W.R.

N67-12733# Esso Research and Engineering Co., Linden, N. J.

EVIDENCE IN METEORITES OF FORMER LIFE: THE ORGANIC COMPOUNDS IN CARBONACEOUS CHONDRITES ARE SIMILAR TO THOSE FOUND IN MARINE SEDIMENTS

Warren G. Meinschein, Bartholomew Nagy, and Douglas J. Hennessy (Fordham Univ.) /in NAS-NRC Extraterrest. Life 1966 p (See N67-12721 03-04) Available from NAS-NRC, Washington, D. C.: \$6.00

Studies relating to the theory that certain meteorites were once a part of the extraterrestrial biosphere are discussed, particularly in relation to the carbonaceous content of Orgueil and other chondrites. The compositions of benzene extracts of soils and marine sediments from various geographical regions on earth are used as references, and it is postulated that these extracts retain evidence of biological activity. It is assumed that similarities between terrestrial and meteorite extracts constitute evidence that the meteorites were either contaminated while on earth or are a part of a parent body which once supported life. Aromatic hydrocarbons are common to both terrestrial and meteoritic sediments; and saturated hydrocarbons isolated from the Murray and Orgueil carbonaceous chondrites have infrared spectra, molecular weight patterns resembling those of other sedimental saturated hydrocarbons. Except for the relative simplicity of the aromatic fraction from the Orgueil fragment, analyses of both chondrite extracts fall within the compositional variations observed in terrestrial sediment extracts of plant and animal hydrocarbons.

M.W.R.

N67-12734# California Univ., Berkeley.

THE FORMATION OF ORGANIC COMPOUNDS ON THE PRIMITIVE EARTH

Stanley L. Miller /in NAS-NRC Extraterrest. Life 1966 p 166-181 refs Reprinted (See N67-12721 03-04) Available from NAS-NRC, Washington, D. C.: \$6.00

Experiments are described that indicate electrical discharges in a mixture of methane, ammonia, hydrogen, and water will produce amino, hydroxyl and aliphatic acids. These same compounds are formed with both spark and silent discharges; when methane, nitrogen, water, and hydrogen are sparked; and when ferrous sulfate is added to the system. Hydrogen cyanide and aldehydes are direct products of the electrical discharge; and these react to produce amino and hydroxynitriles, which are hydrolyzed to the corresponding acid. It is proposed that the same types of compounds would be synthesized if the earth had a reducing atmosphere, but that there would be no organic compound synthesis if oxidizing conditions were present. Therefore, if it is assumed that amino acids and other organic compounds must be present for life to arise, then the atmosphere of the earth must have been reducing and ammonia must have been present in the oceans for the synthesis of amino acids. This implies that the partial pressure of hydrogen was at least 10^{-3} atmospheres.

M.W.R.

N67-12735# California Univ., Berkeley.

ORGANIC COMPOUND SYNTHESIS OF THE PRIMITIVE EARTH

Stanley L. Miller and Harold C. Urey (Calif. Univ., San Diego) /in NAS-NRC Extraterrest. Life 1966 p 182-195 Reprinted Sponsored in part by NSF (See N67-12721 03-04) Available from NAS-NRC, Washington, D. C.: \$6.00

Escape of hydrogen and equilibria of carbon and nitrogen compounds are discussed in relation to the synthesis of organic compounds in the primitive atmosphere. It is noted that the hydrogen loss has made for an overall chemical change to an oxidizing atmosphere in place of the original reducing atmosphere. Many complex organic compounds were formed during this change, thereby establishing a favorable environment for the development of life. Electric discharges, ultraviolet light, radioactivity and cosmic rays, thermal energy; and surface reactions, organic phosphates, and porphyrins are discussed. Intermediate stages in chemical evolution are considered in an attempt to understand the origin of life, and speculations are made on the possibility of life on other planets.

M.W.R.

N67-12736# Houston Univ., Tex.

SYNTHESIS OF PURINES UNDER POSSIBLE PRIMITIVE EARTH CONDITIONS. I: ADENINE FROM HYDROGEN CYANIDE

John Oro and A. P. Kimball /in NAS-NRC Extraterrest. Life 1966 p 196-206 refs Reprinted (See N67-12721 03-04) Available from NAS-NRC, Washington, D. C.: \$6.00 (Grant NSF G-13117)

Adenine has been synthesized in substantial amounts by heating a solution of hydrogen cyanide (1 to 15 M) in aqueous ammonia for one or several days at moderate temperatures (27° to 100°). The insoluble black polymer of hydrogen cyanide was removed by centrifugation and adenine was isolated from the red-brown supernatant by chromatographic methods. The main ultraviolet absorbing compound of the reaction product was identified as adenine by eight different procedures, including ultraviolet spectrophotometry, and melting point of its picrate. From a 11.1 M hydrogen cyanide reaction mixture, at 70°, a yield of 110 mg. of adenine per liter of original reaction mixture was obtained, which could be increased to 685 mg. by evaporation of the supernatant to dryness on the steam bath and subsequent treatment of the residue with hydrochloric acid. Since adenine is an essential building block of nucleic acids and of the most important coenzymes; and since hydrogen cyanide, ammonia, and water are common natural constituents of the solar system, these experiments are considered of significance in relation to the problem of the origin of life. In particular, the experiments provide the first demonstration of the spontaneous synthesis of adenine from simple compounds of carbon and nitrogen under conditions presumed to have existed on the primitive earth.

Author

N67-12737# Houston Univ., Tex.

SYNTHESIS OF PURINES UNDER POSSIBLE PRIMITIVE EARTH CONDITIONS. II: PURINE INTERMEDIATES FROM HYDROGEN CYANIDE

John Oro and A. P. Kimball /in NAS-NRC Extraterrest. Life 1966 p Reprinted (See N67-12721 03-04) Available from NAS-NRC, Washington, D. C.: \$6.00 (Grant NSF G-13117)

In addition to adenine, the supernatant solution from the product of the basecatalyzed condensation of hydrogen cyanide in aqueous ammonia contains several purine precursors such as 4-aminimidazole-5-carboxamide, 4-aminoimidazole-5-carboximidine, formamide, and formamidine. It also contains glycinamide, glycine, alanine, aspartic acid, and a large number of unidentified ultraviolet-absorbing and fluorescing compounds. The data obtained indicate that the mechanism of adenine synthesis occurs by formation of a hydrogen cyanide trimer, possibly aminomalondinitrile, which either directly or after transformation to its mono- or diamidine condenses with formamidine to form 4-aminoimidazole-5-carboximidine. This imidazole derivative condenses in the final step with another molar equivalent of formamidine to form

adenine. Less likely alternative mechanisms of adenine synthesis are also described. These results are considered to be of significance in relation to the formation of imidazoles and other heterocyclic compounds on the abiotic earth. The fact that not only adenine, but also amino acids and polypeptides can be synthesized under similar conditions to the ones used in these experiments supports strongly the geochemical models with reducing conditions for the formation of biochemical compounds on the primitive earth. Author

N67-12739# National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.

FORMATION OF ADENINE BY ELECTRON IRRADIATION OF METHANE, AMMONIA, AND WATER

Cyril Ponnampuram, Richard M. Lemmon, Ruth Mariner, and Melvin Calvin (Calif. Univ., Berkeley) *In* NAS-NRC Extraterrest. Life 1966 244-247 refs Reprinted. Sponsored in part by AEC (See N67-12721 03-04) Available from NAS-NRC, Washington, D. C.: \$6.00

Synthesis of heterocyclic bases from mixtures of primitive gases is investigated; and it is established that adenine is a product of the electron irradiation of a mixture containing methane, ammonia, and water. An inverse relationship is shown between the amount of hydrogen gas present and the amount of adenine synthesized; and, of the five nucleic acid bases, adenine is the most readily synthesized under prebiotic conditions. In all four experiments performed, and in all four paper chromatographic solvent systems used, a perfect coincidence was found in both position and shape between the inactive carrier adenine and one of the radioactive product spots. No guanine, cytosine, uracil, or thymine were detected in any of the chromatograms. The apparent preference for adenine synthesis may be related to its multiple roles in biological systems; e.g., not only is it a constituent in DNA and RNA, but is also a constituent of many important cofactors. The fact that molecular orbital calculations indicate that adenine has the greatest resonance energy of all the biological important purines and pyrimidines, makes the adenine synthesis more likely and confers radiation stability on it. M.W.R.

N67-12740# National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.

SYNTHESIS OF DEOXYADENOSINE UNDER SIMULATED PRIMITIVE EARTH CONDITIONS

Cyril Ponnampuram and Patricia Kirk Available from NAS-NRC, Washington, D. C.: \$6.00

An appreciable yield of deoxyadenosine can be synthesized under the conditions which appear likely to have existed on the primitive earth. Hydrogen cyanide provides the dehydration reaction needed to link the purine adenine and the sugar deoxyribose, and ultraviolet light appears to activate the reaction. While the ultraviolet appears to enhance the yield, the deoxyadenosine is formed even in the absence of ultraviolet. There is also evidence that cyanimide of Mg^{++} can replace CN^- to produce deoxyadenosine; the action of cyanimide may be analogous to that of dicyclohexylcarbodiimide which has been used in the synthesis of nucleotides, but the chemical role of the magnesium is still obscure. M.W.R.

N67-12741# Smithsonian Astrophysical Observatory, Cambridge, Mass.

ON THE ORIGIN AND PLANETARY DISTRIBUTION OF LIFE

Carl Sagan *In* NAS-NRC Extraterrest. Life 1966 p 253-268 refs Reprinted. Presented at the 8th Ann. Meeting of the Radiation Res. Soc., San Francisco, 9-11 May 1960. Sponsored by NAS-NRC (See N67-12721 03-04) Available from NAS-NRC, Washington, D. C.: \$6.00

The role of radiation in the origin and early development of life on earth is considered in relation to studies on extraterrestrial life. Synthesis of organic molecules on the primitive earth, origin of the first self-replicating system, radiation hazards in primitive times, and antimutagenic adaptations and the origin of the cell are

discussed; and speculations are made with regard to life in other part of the solar system. Various observations and experiments indicate that simple organic molecules must be produced in the atmosphere of the Jovian planets by solar ultraviolet or atmospheric electrical discharges; and from the ultraviolet alone, the production rate of molecules per unit area on Jupiter exceeds the meteoritic deposition rate per unit area on earth. The complex organic matter detected in carbonaceous chondrites and observations on the Martian atmosphere and surface are mentioned as indications of extraterrestrial life. M.W.R.

N67-12742# Harvard Univ., Cambridge, Mass. Museum of Comparative Paleontology.

THE NONPREVALENCE OF HUMANOIDS

George Gaylord Simpson *In* NAS-NRC Extraterrest. Life 1966 p 269-281 refs Reprinted (See N67-12721 03-04) Available from NAS-NRC, Washington, D. C.: \$6.00

The origin and evolution of life on earth is discussed, and it is concluded that there are no humanoids existing elsewhere on our solar system. While there is probably no extraterrestrial life anywhere in the solar system, the possibility is not wholly excluded for Mars. Nonetheless, it is felt that there are probably forms of life on other planetary systems, but the chances of people on earth learning about these forms of life are very unlikely. M.W.R.

N67-12743# Rochester Univ., N. Y.

EXTRATERRESTRIAL MICROBIOLOGY

Wolf Vishniac *In* NAS-NRC Extraterrest. Life 1966 p 282-284 Reprinted (See N67-12721 03-04) Available from NAS-NRC, Washington, D. C.: \$6.00

Studies related to possible life on other planets must be concerned with microorganisms because a planetary ecology can be maintained by microorganisms alone and it is technically easier to study the more simple living forms. A summary of oxidation-reduction reactions which affect the balance of nature is presented, and it is concluded that photosynthesis must be the basic economy of Mars as it is on earth. The exploration of life on Mars may be carried out by a device which in principle is a culture tube with a suitable medium that can be monitored for changes in acidity and turbidity; and a proposed apparatus is illustrated. M.W.R.

N67-12744# Harvard Univ., Cambridge, Mass.

LIFE IN THE SECOND AND THIRD PERIODS; OR, WHY PHOSPHORUS AND SULFUR FOR HIGH-ENERGY BONDS?

George Wald *In* NAS-NRC Extraterrest. Life 1966 p 285-300 refs Reprinted (See N67-12721 03-04) Available from NAS-NRC, Washington, D. C.: \$6.00

The natural biological selection of sulfur and phosphorus in organic group and energy transfer functions is discussed. These elements have more open and, usually, weaker bonds than their second period congeners, oxygen and nitrogen; yet they retain the property to form multiple bonds, a property that is otherwise characteristic of carbon, nitrogen, and oxygen. The capacity to form these multiple bonds contributes principally to the thermodynamics of energy transfer; and, in the case of P and S, the possibility of forming five or six covalent bonds is presented. A wide range of resonance possibilities is introduced among the precursors and products of energy exchange reactions that greatly increases the variety and extent of the energy changes that can occur. The third orbitals in P and S permit the expansion of their valences beyond four; and the relatively wide spacing and weaknesses of the P and S bonds, together with their tendency to add lone electron pairs in their unoccupied third orbitals, induces intrinsic instability and vulnerability to attack by other molecules that promote exchange reactions. M.W.R.

N67-12746# Chicago Univ., Ill. Enrico Fermi Inst. for Nuclear Studies.

AGE OF CRATERS ON MARS

Edward Anders and James R. Arnold (Calif. Univ., San Diego) *In NAS-NRC Extraterrest. Life 1966* p Reprinted (See N67-12721 03-04) Available from NAS-NRC, Washington, D. C.: \$6.00 (Grants NsG-366; NsG-321; Contract AT(11-1)-382)

Rate of crater formation on Mars is calculated to be about 25 times higher than that on the moon. The crater density observed by Mariner IV points to an age only one-sixth that of the lunar maria, or 300 to 800 million years. Hence, no conclusions can presently be drawn from these photographs concerning the early Martian environment. Author

N67-12756# National Academy of Sciences--National Research Council, Washington, D. C.
BIBLIOGRAPHY ON EXTRATERRESTRIAL LIFE AND RELATED SUBJECTS

In its Extraterrest. Life 1966 p 383-478 refs (See N67-12721 03-04) Available from NAS-NRC, Washington, D. C.: \$6.00

Almost two thousand references to the world literature on extraterrestrial life, natural sciences, and astronomy are presented. The section on extraterrestrial life covers subjects such as interplanetary and interstellar communication and travel; criteria for origin, and evolution of life; and adaptation of organism, contamination and panspermia, life detection, and sterilization. Chemical reactions, molecular asymmetry and optical activity, photosynthesis, microbiology, geology, and ecology are covered in the section dealing with natural sciences. Planetary environments, atmospheres, and surfaces; the sun and solar system; and asteroids, meteorites, and comets are included under the astronomy section.

M.W.R.

N67-12792 Joint Publications Research Service, Washington, D. C.

BIONICS AND THE PROBLEMS OF INSTRUMENTATION
V. Ye. Manoylov *In its Izv. VUZov: Inst. Bldg. Vol. IX, No. 4* 22 Nov. 1966 p 145-147 (See N67-12761 03-14) CFSTI: \$5.00

Some reports presented at a conference on bionics are briefly summarized. The topics covered by the reports include receptors, analyzers, and identification of forms; neuron organization and bionic systems of reliability; bionic aspects of control, adjustment, and man-machine systems; orientation and navigation of animals and birds; and biomechanics and bioenergetics. The necessity of developing accurate measuring instruments was pointed out. L.E.W.

N67-12818*# Melpar, Inc., Falls Church, Va.
STUDY FOR CONTROL OF MICROBIAL GROWTH IN MANNED SPACECRAFT Phase I Report, 30 Oct. 1964-30 Jan. 1965

Charles R. Goucher 30 Jan. 1965 98 p refs (Contract NAS9-3565)

(NASA-CR-65556) CFSTI: HC \$2.00/MF \$0.75

Spacecraft environmental control systems were examined to locate potential sources of difficulty where microorganisms might grow, concentrate, and cause operational problems. Evaluation criteria applied to known methods of microbial control dealt with power-weight requirements, outgassing properties, mutagenicity, human toxicity, and water potability. Optimum spacecraft locations were determined for the control devices. It was concluded that filtration methods would be most effective in controlling microbial growth in space suits and spacecraft atmospheres. The use of filters with and without impregnation, in addition to a removable biocide, was judged most appropriate for the control of microbial growth in the potable and condensate water systems. Several methods were discussed which are capable of rendering a variety of fabrics biocidal or biostatic. An experimental device was designed which employs a series of resins which release a biocidal material in proportion to microbial contamination, then removes the biocide from waters used for drinking or other spacecraft operations.

Author

N67-12821# Joint Publications Research Service, Washington, D. C.

NEWS OF SOVIET AVIATION AND COSMONAUTICS

1 Dec. 1966 25 p Transl. into ENGLISH from *Aviats. i Kosmonavtika* (Moscow), no. 8, 1966 (JPRS-38906; TT-66-35330) CFSTI: \$1.00

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N67-12822# Joint Publications Research Service, Washington, D. C.

ROUTINE OF SOVIET LONG-RANGE INTERCONTINENTAL STRATEGIC MISSILE-CARRIER DESCRIBED

O. Nazarov *In its News of Soviet Aviation and Cosmonautics* 1 Dec. 1966 p 1-10 (See N67-12821 03-05) CFSTI: \$1.00

A crew member describes his impressions during a routine flight onboard a Soviet long range strategic missile carrier jet aircraft. R.N.A.

N67-12823# Joint Publications Research Service, Washington, D. C.

COSMONAUT POPOVICH DESCRIBES THE VIEW OF THE EARTH FROM OUTER SPACE

P. Popovich *In its News of Soviet Aviation and Cosmonautics* 1 Dec. 1966 p 11-15 (See N67-12821 03-05) CFSTI: \$1.00

Descriptions of the earth as seen from space by both Soviet and American astronauts are given. The phenomenon of improved keenness of sight due to weightlessness and man's usefulness in photographing and observing the earth from spacecraft are briefly discussed. R.N.A.

N67-12830# Association Claude Bernard, Paris (France).

IMMUNOLOGY COMPETENT CELLS [LES CELLULES IMMUNOLOGIQUEMENT COMPETENTES]

Brussels. EURATOM, Aug. 1966 21 p In FRENCH; ENGLISH summary (Contract EURATOM-032-64-1 BIOF) (EUR-3060.F) CFSTI: HC \$1.00/MF \$0.50

The theoretical definition of immunologically competent cells is presented, and their action in allogenic grafts described. In studies of the radiosensitivity of these cells in grafting reactions, it was found that radiosensitivity cannot be acquired by contact with the antigen. The value of antinuclear, antibody research as a test of auto-immune reactivity is indicated from neonatal thymectomy investigations. Hematological studies of white blood cells verified that the number of hyperbasophilic cells appearing the third day is not noticeably different in the group having received the marked lymphoblastes than in the group having received the marked lymphocytes. Briefly outlined also is the sensitivity to various types of chemotherapy of cells involved in various immunization reactions.

Transl. by R.L.I.

N67-12844# Indian Inst. of Science, Bangalore. Fermentation Technology Lab.

MICROBIAL DECOMPOSITION OF PECTIC SUBSTANCES. IV: BACTERIA DECOMPOSING PECTIN WITH PARTICULAR REFERENCE TO SOME XANTHOMONAS SP

M. H. Bilimoria *In its J. of the Indian Inst. of Sci.*, Vol. 48, No. 2 and 3 Jul. 1966 p 53-64 refs (See N67-12843 03-34) CFSTI: HC \$3.00/MF \$0.75

Out of the 313 bacterial cultures surveyed for pectinolytic activity 70 were found pectinolytic. The enzymes make-up of these pectinolytic bacteria consisted generally of polygalacturonase, pectin methylase and *trans*-eliminase systems. All the bacterial pectinases were found to be adaptive in nature. A hitherto unknown mode of attack on the polygalacturonate by *Xanthomonas* pectinase is suspected in as much as a reducing substance (s) other than D-galacturonic acid is formed in this system. Some studies regarding the growth of the *Xanthomonas* sp. and elaboration and inhibition of pectinase produced by it were also carried out.

Author

N67-12847# Indian Inst. of Science, Bangalore. Fermentation Technology Lab.

SUITABILITY OF THE HIGH TEMPERATURE PRE-INCUBATION METHOD FOR ISOLATION OF PECTINOLYTIC ACTINOMYCETES

A. D. Agate *In its* J. of the Indian Inst. of Sci., Vol. 48, No. 2 and 3 Jul. 1966 p 98-101 refs (See N67-12843 03-34) CFSTI: HC\$3.00/MF\$0.75

A comparison of pectinolytic properties of actinomycetes isolated from soils by the use of the high temperature pre-incubation method and the conventional method has revealed the advantage of using the former method for the isolation of pectinolytic species. This method thus holds promise of its exploitation for the isolation of the pectinolytic actinomycetes from any desired ecosystem.

Author

N67-12884# Royal Aircraft Establishment, Farnborough (England). **INVESTIGATIONS ON THE PHYSIOLOGICAL MOVEMENTS OF AMOEBA CHAOS CHAOS L. PART II: THE ACTION OF SALYRGAN, CYSTEIN AND ADENOSINE TRIPHOSPHATE [BEWEGUNGSPHYSIOLOGISCHE UNTERSUCHUNGEN AN DER AMOEBA CHAOS CHAOS L. II: DIE WIRKUNG VON SALYRGAN, CYSTEIN UND A.T.P.]**

Werner Kappner May 1966 33 p refs Transl. into ENGLISH from Protoplasma (Vienna), v. 13, no. 4, 1961 p 504-529 (RAE-LIB-TRANS-1164) CFSTI: HC\$2.00/MF\$0.50

The action of salyrgan, cysteine and adenosine triphosphate on living multinuclear amoebae (*Chaos chaos* L) has been investigated.

Author

N67-12893# Institut Gustave Roussy, Villejuif (France). Biochemistry and Enzymology Lab.

STUDIES ON DNA REPLICATION IN ANIMAL CELLS Annual Report

C. Paoletti, N. Dutheillet-Lamonthezie, Ph. Jeanteur, and A. Obrenovitch Brussels, EURATOM, Aug. 1966 19 p refs (Contract EURATOM-042-64-10 BIOF) (EUR-2959.E) CFSTI: HC\$1.00/MF\$0.50

Ehrlich and Krebs ascites cells DNA is pulse labelled by ³H-thymidine *in vivo* and extracted at various times between 5 minutes and 7 hours after this pulse; radioactive material of the 5 min. DNA displays, when compared to bulk DNA, a higher affinity to MAK columns, a slower sedimentation rate and an increased sensitivity to alkaline denaturation without any change in CsCl and Cs₂SO₄ buoyant density. In DNA extracted longer after this pulse, the part of radioactive material which shows up such characteristics becomes progressively less important and in 2 hours DNA the behavior of labelled material and bulk DNA is nearly identical. The best explanation of these data is the existence of structurally modified DNA, correlated to its replications.

Author

N67-12902*# Sandia Corp., Albuquerque, N. Mex. **[SCOPE OF WORK FOR SCIENTIFIC AND TECHNICAL ASSISTANCE FOR THE PLANETARY QUARANTINE MISSION] Second Quarterly Report, Period Ending Sep. 30, 1966**

Oct. 1966 14 p

(NASA Order R-09-019-040)

(NASA-CR-80201) CFSTI: HC\$1.00/MF\$0.50 CSCL 06M

In an effort to provide parameters associated with initial microbial loading on spacecraft surfaces for the planetary quarantine mathematical model, a study was initiated to determine the model best suited for collection and retention of viable particles that may be present in the atmosphere of a defined environment. A sonic disseminator was developed which is used to load a static clean room atmosphere with stable predictable concentration of dry bacterial spores. A vacuum probe was also developed for retrieving bacteria from surfaces for assay purposes. Studies of viable particle adhesion characteristics and of the physics of viable particle retention on surfaces were initiated. Several microbiological support studies are being initiated to more exactly define some of the biological models which are being transferred into mathematical models. A model was developed which relates total planetary exploration objectives to spacecraft oriented subobjectives.

R.N.A.

N67-12921*# Case Inst. of Tech., Cleveland, Ohio. Solid State Electronics Lab.

[INVESTIGATION OF IMPLANTABLE MULTICHANNEL BIOTELEMETRY SYSTEMS] Semiannual Report, Mar. 1-Aug. 31, 1966

Wen H. Ko and William L. Thompson 15 Sep. 1966 19 p refs

(Grant NGR-36-003-079)

(NASA-CR-79728) CFSTI: HC\$1.00/MF\$0.50 CSCL 06B

Application of advanced electronic technology to the development of integrated circuit multiplexed telemetry systems for biomedical use is discussed. Multiplexing and demultiplexing circuitry for a three-channel system are described and studies of oscillators for the rf carrier of this multiplexing system including crystal controlled types are reported. Two types of oscillators are evaluated and compared: a single transistor noncrystal-controlled oscillator and an amplitude-modulated crystal controlled oscillator. The biomedical telemetry system is discussed with respect to the power supply and the transistor FM transmitters suitable for multiplex biotelemetry.

S.P.

N67-12925*# Fels Research Inst., Yellow Springs, Ohio **POTENTIATION OF INSULIN COMA BY SACCHARIN**

Elliot S. Valenstein and Margaret L. Weber (Antioch Coll.) Repr. from J. of Comp. and Physiol. Psychol., v. 60, no. 3, 1965 p 443-446

(Grants NSG-437; NIH MH-4529; NIH MH-K6-4947)

(NASA-CR-80197) CFSTI: HC\$1.00/MF\$0.50 CSCL 06P

Rats receiving an injection of insulin which was lethal to approximately 50% of untreated animals were permitted to drink either a saccharin, water, or glucose solution. Saccharin potentiated the effect of insulin, as significantly more Ss of this group succumbed than did those in the water group: Ss that had glucose were protected. It may be an error to assume that saccharin is physiologically inert. Speculation concerning the question of why a non-/nutritive substance such as saccharin may serve as an effective reward for animals is also presented.

Author

N67-12930*# IIT Research Inst., Chicago, Ill. **LIFE IN EXTRATERRESTRIAL ENVIRONMENTS Quarterly Status Report, Aug. 15-Nov. 15, 1966**

Charles A. Hagen 15 Nov. 1966 18 p

(Contract NASr-22)

(NASA-CR-80187; IITRI-L6023-7) CFSTI: HC \$1.00/MF \$0.50 CSCL 06F

Simulated Martian environment experiments were conducted with *Staphylococcus aureus* and the effects of barometric pressures and carbon dioxide concentrations were studied. *S. aureus* grew rapidly in Earth atmospheres at all barometric pressures and concentrations of carbon dioxide. Maximum populations were reached as early as 3 days with an 8-hr daily freeze and 7 days with

20-hr daily freeze. Maximum populations of *S. aureus* were 100- to 1000-fold higher than initial populations. Brunizemic and podzolic soils tested were adequate to support the growth of *B. cereus*, *L. plantarum*, *P. aeruginosa*, Pa 3679, *S. aureus*, and *S. albus*. An 8-hr daily freeze did not affect the growth of these organisms in brunizemic soil, but did decrease or inhibit growth in the podzolic soil. S.P.

N67-12940*# California Univ., Los Angeles.
**ALTERED PULMONARY HEMODYNAMICS FOLLOWING
 EXPERIMENTAL DECOMPRESSION SICKNESS**

A T. K. Cockett and Ray T. Kado [1965] 9 p refs
 (Contract NAS2-2151; Grant Nsg-237-62)
 (NASA-CR-79726) CFSTI: HC \$1.00/MF \$0.50 CSCL 06E

A new pulmonary isotopic scanning technique prompted development of a method to assess the extent of pulmonary embolism by scanning the pulmonary arteriolar tree prior to and immediately following decompression. Hemodynamic and pathophysiological findings that occur following lethal decompression from depths in the 165-175 foot range are reported. An abrupt rise in pulmonary arterial pressure following significant decompression is attributed to the development of a moderate pulmonary arteriolar-capillary blockade. The pulmonary emboli apparently disappear in dextran treated animals within 48 hours. Maintenance of effective pulmonary arterial circulation is apparently due to the mechanisms of dextran replacement and development of collateral circulation in the involved areas. S.P.

N67-12957# Library of Congress, Washington, D. C. Aerospace Technology Div.

**BIOLOGICAL EFFECTS OF HIGH-FREQUENCY
 ELECTROMAGNETIC WAVES** Translations of Foreign Scientific and Technical Literature

Vladimir E. Mutschall 13 Jul. 1966 18 p refs
 (ATD-66-92)

Physicists, chemists, biologists, and doctors are all interested in finding out whether electromagnetic waves cause chemical and biological changes similar to those brought about by ionic radiation. Previous experimental work on the influence of high-frequency electromagnetic waves on organic and inorganic matter is briefly covered. The influence of high-frequency electromagnetic waves on living matter, especially in the field of microwaves is discussed. Penetration of high-frequency energy into the organism, electromagnetic induction of the body, and the existence of the non thermal effect of electromagnetic waves are considered. Symptoms of damage are listed and methods of protection discussed. Author

N67-12971*# Exotech, Inc., Washington, D. C.
**ANALYTICAL TECHNIQUES IN PLANETARY QUARANTINE
 AND SPACECRAFT STERILIZATION** Final Report

Samuel Schalkonsky Nov. 1966 48 p refs
 (Contract NASw-1340)
 (NASA-CR-80337) CFSTI: HC \$2.00/MF \$0.50 CSCL 06M

Analytical methods and calculations are reported which relate (1) the prediction of the hazard of biological contamination of other planets; (2) the specification of planetary quarantine requirements; (3) the functional correlation of experimental data on microbial lethality during heat sterilization; and (4) the proper allowance for integrated lethality during transient heat-up and cool-down of a space capsule. Existing analytical techniques in the field of sterilization are found to be inadequate for the planetary quarantine program and improved methods have therefore been developed in all of the areas considered. These are summarized in the report and related documentation. Author

N67-12979*# Colorado State Univ., Fort Collins. Dept. of Physiology.

**STUDIES ON THE INCORPORATION OF ISOTOPICALLY
 LABELED NUCLEOTIDES AND AMINO ACIDS IN
 PLANARIA**

Jay Boyd Best, Robert Rosenfold, Jacqueline Souders, and Carlton Wade Repr. from J. Exptl. Zoology, v. 159, no. 3, Aug. 1965 p 397-403 refs

(Grants NsO-625; NIH-MH-07603-02-EP-RO1)
 (NASA-CR-80357) CFSTI: HC \$1.00/MF \$0.50 CSCL 06C

Neither intact nor regenerating planaria incorporated any significant amount of tritiated thymidine, tritiated L-leucine, or C¹⁴L-leucine from free solution even over long periods of exposure. Tritiated thymidine was incorporated into regenerating rat liver and fed to planaria, but tritium hydrogen exchange rendered this method useless. A large incorporation of C¹⁴-uracil and C¹⁴L-leucine into planaria was obtained by growing baker's yeast in a defined medium containing the labeled compound and then feeding the acetone dried yeast to the planaria. C¹⁴ assay of the amino acid components of planaria fed on C¹⁴-L-leucine labeled yeast showed C¹⁴ in only the L-leucine component and yielded a minimum estimate for protein turnover of 46% in seven weeks. Radioautographs of planaria fed on C¹⁴-uracil labeled yeast exhibited specific incorporation into ribonucleic acid. Previous radioisotopic studies on planaria are evaluated. Author

N67-12980*# Ohio State Univ. Research Foundation, Columbus. Environmental Medicine Lab.

CARDIOVASCULAR EFFECTS OF VIBRATION Semiannual Report, 1 Feb.-3 Jul. 1966

Lester B. Roberts and John H. Dines Oct. 1966 22 p
 (Grant NGR-36-008-041; RF Proj. 2045)

(NASA-CR-80356, Rept.-2) CFSTI: HC \$1.00/MF \$0.50 CSCL 06S

Presented are descriptions and results of two studies. In the first study, cardiovascular changes during vibration were observed in a dog after administration of propranolol. Apart from a slower initial heart rate, the results were similar to those obtained under control conditions before propranolol was given. Cardiac output, (dp/dt)_{max} of LVP, and fluctuations in blood pressure were observed. No changes in left ventricular end-diastolic pressure were noted. In the second study, the effects of electrode design, skin preparation, and electrode placement in reducing electrical noise in electrocardiograph signals obtained from human subjects during vibration were observed. Experimental procedures are described in detail. It is concluded that if procedures are followed as outlined, a minimum of electrical noise usually associated with ECGs can be expected during recordings from human subjects being vibrated. K.W.

N67-12997*# Exotech, Inc., Alexandria, Va.

**LOG-NORMAL MODEL FOR MICROBIAL SURVIVAL IN
 HEAT STERILIZATION**

Samuel Schalkowsky and Robert Wiederkehr Oct. 1966 40 p refs

(Contract NASw-1340)
 (NASA-CR-80373; TR-015) CFSTI: HC \$2.00/MF \$0.50 CSCL 06M

An analytical model is developed for the survival times of organisms in heat sterilization in which the probability of inactivation as a function of exposure time is log-normally distributed. Experimental data is examined relative to this model and it is concluded that the model is valid except during the initial period of heating when an additional interaction between the organisms and their surrounding medium appears to be present. At long heating times, the log-normal model appears more accurate for extrapolating to low survival probabilities than the usual logarithmic survivor curves and it generally more conservative. Author

N67-13002*# California Univ., La Jolla. Dept. of Chemistry.
HYDROCARBONS IN THE BANANA LEAF, MUSA SAPIENTUM

Bartholomew Nagy, Vincent Modzeleski, and Marty T. J. Murphy
Repr. from *Phytochemistry*, v. 4, 1965 p 945-950 refs
(Grant NsG2541)

(NASA-CR-80360) CFSTI: HC \$1.00/MF \$0.50 CSCL 06A

Several long-chain n-alkane compounds have been identified by the vapor phase chromatography of urea adducted samples which were prepared from the n-hexane eluate fractions of the chloroform-methanol extracts of homogenized leaves. In addition, certain types of alkyl-substituted, fused polycyclic aromatic hydrocarbons have been determined by mass spectrometry, fluorometric, u.v., and i.r. spectroscopy in fractions isolated by preparative thin-layer chromatography from saponified banana leaf extracts. The hydrocarbon composition of most banana leaf extracts differed in part from the hydrocarbon compositions of other plants, namely two xerophytic angiosperms, a moss, a marine alga, a mushroom and two dissimilar red bacteria. Author

N67-13007*# Colorado State Univ., Fort Collins.

BEHAVIOUR OF PLANARIA IN INSTRUMENTAL LEARNING PARADIGMS

Jay Boyd Best Repr. from *Animal Behaviour Suppl.* 1, [1963] p 69-75 refs

(Grants NsG-625; NIH G-MH-076203-02)

(NASA-CR-80380) CFSTI: HC \$1.00/MF \$0.50 CSCL 06C

Several experiments conducted to study the behavior of worms are discussed, and their reactions to an imprisoning environment are analyzed. Various response patterns are compared with those observed in high vertebrates, and several similarities are noted. Conflict behavior was noted around the end of the first training session; it is pointed out that this is about the point where it would appropriately be manifested in a higher animal such as a rat. In other tests, an improved learning performance was observed at the beginning of the second session. This phenomenon, in which learning occurred during a period of no overt practice, is considered to be similar to the reminiscence effect formed previously in mammals. The effect of the lunar cycle on performance is also assessed. M.G.J.

N67-13010*# Cincinnati Univ., Ohio. Coll. of Medicine.

THE EFFECT OF NEUTRAL AND ACIDIC POLYSACCHARIDES ON NATURAL RESISTANCE OF MICE TO BACTERIAL CHALLENGE

Peter F. Bonventre and Bernard Black-Schaffer Repr. from *J. of Infectious Diseases*, v. 115 Oct 1965 p 413-420 refs

(Grants NsG-75, PHS-AI-04315)

(NASA-CR-80377) CFSTI: HC \$1.00/MF \$0.50 CSCL 06C

Experiments were conducted to determine the effect of several dextrans and dextran sulfates on the resistance of mice to either staphylococcal or shigella infection. The data show that nonionic dextrans have no effect on resistance; acidic dextran sulfates, however, demonstrated a significant resistance-lowering capacity. The results also suggest that both the size and net charge on the polysaccharide molecule contribute to its ability to alter host resistance. The high molecular weight dextran sulfate was found capable of either decreasing or increasing resistance to bacterial challenge. This dual effect was correlated with reticuloendothelial blockade and reticuloendothelia stimulation, respectively. M.G.J.

N67-13015*# California Univ., Los Angeles.

RENAL LYMPH OXYGEN TENSION DURING GRADED RENAL ISCHEMIA

A. T. K. Cockett, M. Kazmin, R. S. Moore, R. T. Kado, and R. P. Roberts [1963] 2 p ref

(Grants NsG-237-62; PHS-G-HE-09834-02)

(NASA-CR-79736) CFSTI: HC \$1.00/MF \$0.50 CSCL 06P

Summary data are presented on experiments in which the renal lymph fluid of dogs was collected as a means of assessing tissue oxidation. Normal renal lymph oxygen tension is listed. The results suggest that oxidative metabolic processes are extremely

active within the kidney; renal lymph oxygen tension levels significantly exceeded the arterial levels. M.G.J.

N67-13059# Library of Congress, Washington, D. C. Aerospace Technology Div.

PROBLEMS OF SPACE MEDICINE Surveys of Foreign Scientific and Technical Literature

B. Mandrovsky, C. Dodge, D. Pyle, and J. Smith 13 Sep. 1966 272 p refs Compilation of Abstracts

(ATD-66-116)

This compilation is based on papers presented at the conference sponsored by the Moscow Physiological Society and the Institute of Biomedical Problems of the USSR Ministry of Health. There are eleven parts in this report: general and methodology; experiments in space; effects of combined factors; dynamic factors; radiobiology; gas environment and respiratory problems; isolation, hypokinesia, and orthostatic problems; miscellaneous problems; selection and training; life support systems; and biotelemetry and human engineering. Author

N67-13100*# Naval School of Aviation Medicine, Pensacola, Fla.

ACUTE ALCOHOL ATAXIA IN RELATION TO VESTIBULAR FUNCTION

Alfred R. Fregly and Ashton Graybiel 22 Jun. 1966 16 p refs

(NASA Order R-93)

(NASA-CR-80433; NAMI-973) CFSTI: HC \$1.00/MF \$0.50 CSCL 06P

Determination of alcohol effects on postural equilibrium of bilateral labyrinthine defective individuals was made to aid in the elucidation of the functional role of the vestibular organ in man. Generally, severity and duration of the intoxicating effects were found to be less than those observed in a previous study on vestibular-intact individuals. The superimposition of an "acute alcohol ataxia" on vestibular-impaired individuals appears to depend upon the degree to which nonvestibular functions can be made to compensate for the initial characteristic vestibular ataxia. Author

N67-13113*# Catholic Univ. of America, Washington, D. C. Dept. of Biology.

GENETIC STUDIES OF HYDROGEN BACTERIA AND THEIR APPLICATIONS TO BIOLOGICAL LIFE SUPPORT SYSTEMS Status Report No. 3, May 1-Oct. 31, 1966

B. T. De Cicco 31 Oct. 1966 15 p ref

(Grant NGR-09-005-022)

(NASA-CR-80432) CFSTI: HC \$1.00/MF \$0.50 CSCL 06M

Mutant *Hydrogenomonas eutropha* cultures resistant to each of four bacteriophage types were obtained by exposing a large bacterial population to a large number of phages on heterotrophic agar. Phage resistant clones were then isolated and tested for their sensitivity to the other three phage types. The results are tabulated, and the data are discussed. The growth of *H. eutropha* under simultaneous autotrophic and heterotrophic conditions; and work efforts concerning the determination of nutritional requirements of *H. eutropha* auxotrophs are also discussed. A closed environment chemostat for cultivation of hydrogen bacteria for cultural stability studies is described and a diagram of the chemostat is depicted. L.S.

N67-13128*# California Univ., Berkeley. Space Sciences Lab.

STUDY OF GROWTH IN RECENT AND FOSSIL INVERTEBRATE EXOSKELETONS AND ITS RELATIONSHIP TO TIDAL CYCLES IN THE EARTH-MOON SYSTEM Semiannual Report, May 1-31, 1966

W. B. N. Berry 30 Sep. 1966 7 p *Its* Space Sci. Lab. Ser. No. 7, Issue No. 45

(Grant NGR-05-003-067)

(NASA-CR-80485) CFSTI: HC \$1.00/MF \$0.50 CSCL 06C

Techniques for discerning growth cycles in fossil pelecypod shells and a tentative morphogenetic classification of those cycles are presented. Estimations of the length of the months and years in the prehistoric past are made based on the relationship between environmental rhythms and the growth cycles. The growth layers observed in the shells of both fossil and modern pelecypods are tentatively classified in six types. Investigations indicate a slow and continual decrease in number of months per year, from 13 in the Carboniferous period to 12.5 in the Cretaceous, to 12 at the present time. Somewhat more synodic days per month appeared in the Cretaceous than at present. It is suggested that changes in distribution of angular momentum have taken place within the earth-moon system. S.P.

N67-13129* Public Health Service, Cincinnati, Ohio. Div. of Environmental Engineering and Food Protection.

ECOLOGY AND THERMAL INACTIVATION OF MICROBES IN AND ON INTERPLANETARY SPACE VEHICLE COMPONENTS Sixth Quarterly Report, Jul. 1-Sep. 30, 1966

Robert Angelotti Oct. 1966 19 p refs

(NASA Order R-36-015-001)

(NASA-CR-80484) CFSTI: HC\$1.00/MF\$0.50 CSCL 06M

The dry heat resistance of *Bacillus subtilis* var. *niger* spores encapsulated in Lucite rods at an inoculum of approximately 1×10^8 spores per gram and exposed to temperatures of 105, 120, and 160°C was determined. The D values and their corresponding 95% confidence intervals were found to range respectively: $D_{105} = 1.2$ to 1.3 days, 95% C.I. of 1.1 to 1.5 days; $D_{120} = 5.9$ to 6.2 hours, 95% C.I. of 5.0 to 6.8 hours; $D_{160} = 4.6$ to 4.8 minutes, 95% C.I. of 3.8 to 4.9 minutes. A decimal reduction time curve was constructed employing the D values from all temperatures studied to date. The slope of this curve over the temperature range of 105°C to 160°C yielded a value of $z_D = 20.8$ Centigrade degrees. Author

N67-13144* Deutsche Versuchsanstalt für Luft- und Raumfahrt, Bad Godesberg (West Germany). Institut fuer Flugmedizin.
GASCHROMATIC COLUMN CIRCUIT FOR ANALYSIS OF GASES IN CLOSED SYSTEMS FOR BIOLOGICAL AND BIOMEDICAL INVESTIGATIONS [GASCHROMATOGRAPHISCHE KOLONNENSCHALTUNG FUER DIE ANALYSE DER GASE IN GESCHLOSSENEN SYSTEMEN FUER BIOLOGISCHE UND BIOMEDIZINISCHE UNTERSUCHUNGEN]

Wolfgang Briegleb Sep. 1966 11 p refs In GERMAN; ENGLISH summary

(DLR-FB-66-60; DVL-566) CFSTI: HC\$1.00/MF\$0.50

Description of a variable gaschromatic column circuit for measuring O₂, N₂, CO₂, CO, HE, Ar and also the lower hydrocarbons in a single run. Author

N67-13153* Institut Gustave Roussy, Villejuif (France).
RECOVERY EFFECT OF NUCLEIC ACIDS AFTER IRRADIATION [EFFET RESTAURATEUR DES ACIDES NUCLEIQUES APRES IRRADIATION] Annual Report

Brussels. EURATOM, Aug. 1966 18 p refs In FRENCH; ENGLISH summary

(Contract EURATOM-055-64-10 BIOF)

(EUR-2765.F) CFSTI: HC\$1.00/MF\$0.50

In an attempt to study the radiorecovery effect of desoxyribonucleic acid (DNA) on cultured mammal cells, tests were performed to determine whether the acid penetrates the cells under experimental conditions. The cell used was obtained from a cell of male mouse fibroblasts and was selected for its characters stability and because radiobiological studies could be carried out with it (in particular, survival curves). After two hours contact with the radioactive DNA, the cells are lysed and the cellular and exogenous DNA separated by density gradient in caesium chloride. Measurement of the radioactivity and DNA content of each fraction of the gradient shows that: the exogenous DNA penetrates the

cells; this penetration is proportional to the quantity of DNA in contact with the cells; and the hypothesis to the effect that the tracer is re-used by the cells can be discounted, since the radioactivity is localized in the gradients in a very narrow strip of the DNA peak. Author

N67-13182* National Aeronautics and Space Administration, Washington, D. C.

AEROSPACE MEDICINE AND BIOLOGY-A CONTINUING BIBLIOGRAPHY WITH INDEXES, OCTOBER, 1966

Nov. 1966 180 p refs

(NASA-SP-7011(30)) CFSTI: HC\$1.00/MF\$1.00 CSCL 06S

A selection of annotated references to unclassified reports and journal articles in aerospace medicine and biology is presented that were introduced into the NASA information system during October, 1966. Emphasis is placed on biological, physiological, psychological, and environmental effects to which man is subjected during the following simulated or actual flight in the earth's atmosphere or in interplanetary space. G.G.

N67-13197* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DIGITAL COMPUTER PROCESSING OF X-RAY PHOTOGRAPHS

R. H. Selzer 15 Nov. 1966 23 p refs

(Contract NAS7-100)

(NASA-CR-80521; JPL-TR-32-1028) CFSTI: HC\$1.00/MF\$0.50 CSCL 06B

The interpretation of medical and biological pictures, such as X-ray photographs, can frequently be made easier if selected portions of the image are first enhanced by means of a digital computer. Two particular enhancement methods are described in this report. The first method uses image subtraction to achieve enhancement by removing unimportant information from the picture. The second method uses two-dimensional filtering to achieve enhancement by emphasizing selected portions of the picture frequency spectrum. This filtering method is particularly useful for bringing out fine detail that is totally invisible on the unprocessed picture. Examples of enhanced medical X-rays, photomicrographs, and infrared photographs are shown. Author

N67-13251* California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.

A FORTRAN IV PROGRAM FOR EVALUATION OF THYROIDAL ASSIMILATION OF RADIOIODINE

Norman R. French Jun. 1966 13 p refs

(Contract AT(O4-1)-GEN-12)

(UCLA-12-592) CFSTI: HC\$1.00/MF\$0.50

A fortran IV program was developed for the computer reduction of data on the thyroid uptake and effective half-life of ingested ¹³¹I in different mammalian species and of members of the same species on different diets. Experimental animals were given a measured quantity of ¹³¹I solution orally and the radioactivity from the thyroid was counted by means of a scintillation counter twice in the first 24 hr and daily thereafter for 14 days. The animals were sacrificed and the thyroid was counted in a well-typed scintillation detector. The counting data were used to calculate the effective half-life of ¹³¹I in the thyroid of each animal and the mean, standard deviation, the sum of deviations squared for each group of animals, and the effects of diet on ¹³¹I uptake by the thyroid gland. NSA

N67-13253* Oak Ridge National Lab., Tenn. Health Physics Div.

SAFETY ANALYSIS OF RADIONUCLIDE RELEASE TO THE CLINCH RIVER Progress Report No. 3

K. E. Cowser and W. S. Snyder May 1966 152 p refs
Presented at the Clinch River Study Steering Comm. Meeting, 15 16
(Contract W-7405-ENG-26)
(ORNL-3721, Suppl. 3) CFSTI: HC \$4.00/MF \$0.75

One of the principal objectives of the Clinch River Study has been the evaluation of radiation dose equivalent to populations downstream from operations at the Oak Ridge National Laboratory. Evaluation was based on long-term monitoring data (1944 to 1963) and the identification of critical exposure pathways and population groups. Knowledge of water utilization downstream indicates that the important avenues of exposure from discharge of low-level contaminated waste water to the Clinch River include consumption of contaminated water and fish, consumption of agricultural produce that may be irrigated with river water, exposure to contaminated water and bottom sediments during recreational and industrial use of the water, and exposure to buildup of sludge and deposits in water systems utilizing river water. The major sources of exposure are currently the ingestion of contaminated water and fish. Mathematical models were developed for internal dose calculations and include the differences in intake and in size of the critical organ as a function of the individual's age. It was found that the skeleton of man received the largest exposure and ^{90}Sr was responsible for more than 99% of the dose equivalent. Based upon realistic but conservative assumptions, the estimated total doses from internal and external sources (20 year period) received by the skeleton of critical population groups, the 18-year-old individuals (in 1944) utilizing the Clinch River and the 14-year-old individuals (in 1944) utilizing the Tennessee River were 3.2 Rem and 0.45 Rem, respectively. These values are about a factor of 10 less than permissible limits established by ICRP and FRC. Methods of calculation are presented, and examples are given for the transfer of ^{90}Sr and ^{137}Cs to man by irrigation water. If irrigation is practiced on the Clinch River in the future, it may become the dominant exposure pathway. It is noteworthy that in 1962 and 1963 fallout from nuclear tests contributed the same quantity of the critical radionuclide, ^{90}Sr , to the Clinch River as did purposeful releases from the laboratory. Author (NSA)

N67-13259*# Fairchild Engine and Airplane Corp., Farmingdale, N. Y.

EFFECT OF DIET AND ATMOSPHERE ON INTESTINAL AND SKIN FLORA. VOLUME II: LITERATURE SURVEY

Phyllis E. Riely and Lorraine S. Gall Washington, NASA, Dec. 1966 137 p refs

(Contract NAS9-4172)

(NASA-CR-662) CFSTI: HC \$3.00/MF \$1.00 CSCL 06M

A review and evaluation of the literature concerning the microflora of the integument, i.e. microorganisms which exist in or on the skin, is presented. Considered are the following general and specialized skin areas: anal fold; axilla; external ear; eye; fingernails; scalp; toenails; and umbilicus. Both aerobic and anaerobic bacteria as well as yeasts, molds, fungi, actinomycetes, and viruses are included. In addition, pertinent observations made during two studies of men subjected to certain simulated space flight conditions are reported. The first study included a comprehensive microbiological survey of the skin flora from four groups of four men who were confined for 33 days and who were sampled in several skin areas 13 times during that period. In the second study, six of the men were confined together under the test atmosphere, while two men, who served as control, were confined at ambient atmospheres. K.W.

N67-13272*# California Univ., Los Angeles. Dept. of Anatomy.
IRRADIATION EFFECTS ON BRAIN WAVE CORRELATES OF CONDITIONED BEHAVIOR Final Report, 1960-1966

W. R. Adey and R. L. Schoenbrun [1966] 72 p

(Contract AT(11-1)-34)

(UCLA-34P60-1) CFSTI: HC \$3.00/MF \$0.75

The effects of low doses of x irradiation on brain wave activity recorded from temporal lobe structures during conditioned behavior in the cat were studied. A major effort was directed to evaluation of several behavioral training techniques with concurrent EEG recording. Initial studies utilized 250 kv X rays in doses ranging from 100 to 1,500 R delivered to the whole head. Later studies involved a technique of focal brain irradiation with 910 Mev γ particles that permitted selective irradiation of discrete regions. A novel stereotaxic alignment frame was designed for precision placement in focal irradiations. Data are presented on electrophysiological behavioral and morphological changes induced by whole head or focal exposure. NSA

N67-13325*# Michigan State Univ., East Lansing. Dept of Botany and Plant Pathology.

FACTORS RESPONSIBLE FOR CHANGES IN RADIOSENSITIVITY OF EMBRYONIC TISSUES Technical Progress Report, 1965-1966

L. W. Mericle and R. P. Mericle 31 May 1966 20 p refs

(Contract AT(11-1)-1400)

(COO-1400-10) CFSTI: HC \$1.00/MF \$0.50

Factors responsible for changes in radiosensitivity of embryonic tissues were studied in barley and Tradescantia. Results are summarized from studies of the normal pattern of floral bud development in hybrid Tradescantia plants; the occurrence of spontaneous color mutants in Tradescantia; the influence of environmental factors and autofluorescence age on the radiosensitivity of Tradescantia bud clusters exposed to 60 R X radiation; the genetic effects of uv. visible light, chronic, low-level ^{60}Co γ irradiation, and diurnal temperature variations in Tradescantia; the effects of a single acute exposure to 450 R X radiation on barley embryo material, and the biological effects of ^{60}Co γ radiation in the first 3 to 5 mm of tissue depth in barley heads containing embryos and in Tradescantia. NSA

N67-13339*# Worcester Foundation for Experimental Biology, Shrewsbury, Mass.

[STEROID SYNTHESIS, ANALYSIS, AND METABOLISM] Progress Report, 1 May 1965-30 Apr. 1966

Gregory Pincus 13 Jun. 1966 25 p refs

(Contract AT(30-1)-918)

(NYO-918-15) CFSTI: HC \$1.00/MF \$0.50

Developments are reported for studies on: synthesis of steroid labeled radioisotopes; application of methods for automation of steroid analysis; steroid biogenesis and metabolism; and effects of radiation on steroid metabolism. NSA

N67-13399*# Advisory Group for Aerospace Research and Development, Paris (France).

PILOT BEHAVIOUR IN VTOL AIRCRAFT

G. Schweizer Oct. 1965 100 p refs Presented at the 27th Meeting of the AGARD Flight Mech. Panel, Rome, 11 12 Oct 1966

(AGARD-521) CFSTI: HC \$3.00/MF \$0.75 CSCL 05H

Information about the handling qualities of new aeroplanes which are in the development stage is very important, since the control system, the autostabiliser and part of the avionics system are strongly influenced by the handling qualities of the aircraft. Since the pilot is nearly always included in the control loop for guidance and stability, it is difficult to obtain objective, quantitative information about the handling qualities. In the course of the development program many flight tests were carried out with a hovering rig to investigate the handling qualities of the aeroplane. The main aim of the flight tests was to obtain objective information in addition to the subjective opinion of the pilot. The amplitude distribution functions for control moments and the power spectra of the control deflections have proved to be important aids. Test runs, in which the expected flight conditions were simulated on a small hovering rig, were of great use. Author

N67-13404# Technology, Inc., San Antonio, Tex. Life Sciences Div.

A STUDY OF THE PRODUCTION OF CHORIORETINAL LESIONS BY THERMAL RADIATION

Thomas A. Alexander, Ralph G. Allen, Jr., Roger L. Bessey, Earl R. Lawler, Jr., and William R. Bruce *In its Res. on Ocular Effects Produced by Thermal Radiation* Jul. 1966 25 p refs (See N67-13401 04-14) CFSTI: HC\$4.00/MF\$1.00

Chorioretinal burns have been systematically produced in pigmented rabbits under carefully controlled laboratory conditions. Lesions were produced by high-intensity light flashes ranging in duration from 165 microseconds to 250 milliseconds and with image diameters which ranged from 1.0 mm to 0.11 mm. From these measurements relationships were obtained between exposure duration and threshold irradiance for the production of 5-minute minimal lesions. Author

N67-13405# Technology, Inc., San Antonio, Tex. Life Sciences Div.

AN EXAMINATION OF THE PRODUCTION OF CHORIORETINAL BURNS IN TERMS OF TEMPERATURE DISTRIBUTIONS

Ralph G. Allen, Jr., Arthur F. Muller, Earl R. Lawler, Jr., and William R. Bruce *In its Res. on Ocular Effects Produced by Thermal Radiation* Jul. 1966 39 p refs (See N67-13401 04-14) CFSTI: HC\$4.00/MF\$1.00

The eyes of an adult rabbit were subjected to a series of controlled exposures to investigate the relationship between ophthalmoscopically visible results and the temperature rise produced in the chorioretinal region. Minimally visible effects were associated with a temperature rise in the pigment epithelium of 15–20°C for the exposure condition investigated. At temperatures above 20°C lesions appeared almost immediately and were approximately the size of the image on the retina, or somewhat larger. For temperature increases of 15–20°C the appearance of visible change was delayed several hours and the size of the disturbed area was considerably less than the image size. It was concluded that a simple temperature criterion seems to be inadequate for a quantitative description of the extent of visible changes and/or the model used for calculating the temperature distributions may not be adequate. S.P.

N67-13421# Joint Publications Research Service, Washington, D.C.

REPORTS PRESENTED AT SOVIET CONFERENCE ON SPACE BIOLOGY AND MEDICINE

A. V. Lebedinskiy, ed. 10 Nov. 1966 156 p refs Transl. into ENGLISH of the book "Materialy Konferentsii Po Kosmicheskoy Biologii i Meditsine" Moscow, Acad. of Med. Sci. USSR, 1966 p 1 150

(JPRS-38596; TT-66-35021) CFSTI: \$4.00

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N67-13422# Joint Publications Research Service, Washington, D.C.

GENERAL PATTERNS OF REACTIONS OF THE HUMAN BODY TO THE COMBINED EFFECT OF THE TYPICAL ENVIRONMENTAL FACTORS IN SPACECRAFT CABINS

A. V. Lebedinskiy, S. V. Levinskiy, and Yu. G. Nefedov *In its Rept. Presented at Soviet Conf. on Space Biol. and Med.* 10 Nov. 1966 p 1–8 (See N67-13421 04-04) CFSTI: \$4.00

Special chamber tests lasting from 10 to 120 days were performed to investigate human reactions to a prolonged stay in a hermetically sealed and limited space. Analysis of immunological reactivity changes of the subjects and correlation of these data with changes in the environmental microflora showed a quantitative increase of microorganisms that vegetate on the skin and thus significantly increased bacterial contamination of the cabin atmosphere. Also observed was carbon monoxide excreted from the human body and accumulated in the air. This autointoxication increased the gas pressure in the alveolar air and influenced the regulatory mechanisms of external respiration and tissular gas metabolism. Complex physiological examinations during 120-day

tests showed that the observed sound sleep inhibition was marked by a decrease or total absence of delta waves from the EEG's. Standardization of living conditions and a strict activity schedule during the day developed in all subjects an imposed performance stereotype for most physiological functions. G.G.

N67-13423# Joint Publications Research Service, Washington, D.C.

THE BASIC PRINCIPLES IN THE DESIGN OF RECIRCULATION (REGENERATION) SYSTEMS

V. I. Yzadovskiy *In its Rept.* presented at Soviet Conf. on Space Biol. and Med. 10 Nov. 1966 p 9-16 (See N67-13421 04-04) CFSTI: \$4.00

On the basis of a preliminary assay of man's requirements with respect to food, water, oxygen, etc., and the possibility of realizing these conditions during long space flights, a proposed composition of potential links for a future biological technical system is projected. It encompasses: man, autotrophs, heterotrophs, food link, link of utilization with chemical correction of nutrient solutions, physicochemical correction, and water regeneration. Depending on the purpose and flight trajectory, different variants of the above described biological technical system can be utilized. G.G.

N67-13424# Joint Publications Research Service, Washington, D.C.

THE WAYS AND MEANS OF UTILIZING THE PRODUCTS OF VITAL FUNCTIONS IN SPACECRAFT CABINS

S. V. Chizhov *In its Rept.* presented at Soviet Conf. on Space Biol. and Med. 10 Nov. 1966 p 17-20 refs (See N67-13421 04-04) CFSTI: \$4.00

Regeneration of substances from products of vital human functions during prolonged space flight is advocated by rationally combined physicochemical and biological processes. Functional links in the utilization system include: mineralization, regeneration of water and gases, and correction of mineral nutrition. A possibility of synthesizing foods on-board a spacecraft from human wastes is projected. G.G.

N67-13425# Joint Publications Research Service, Washington, D.C.

THE POSSIBILITY OF USING DEHYDRATED PRODUCTS AS FOOD FOR ASTRONAUTS

V. P. Bychkov, N. N. Boyko, A. G. Kasatkina, Yu. I. Kondrat'yev, and A. S. Ushakov *In its Rept.* presented at Soviet Conf. on Space Biol. and Med. 10 Nov. 1966 p 21-26 (See N67-13421 04-04) CFSTI: \$4.00

Diets consisting of products dehydrated by thermal or sublimation methods were used on human subjects to test their influence on the metabolic processes of the human body. Three diets were compiled from foods listed in a table, and their weight, composition, and caloric values were determined. Experiments varied from 20 to 22 days. Assimilation data for diets consisting of dehydrated foods showed a decrease in protein and fat uptake but no change in carbohydrate assimilation. Nitrogen balance was positive throughout the tests except in younger and taller subjects. It was concluded that individual distinctions of the human organism must be considered in the preparation of diets for long durations. G.G.

N67-13426# Joint Publications Research Service, Washington, D.C.

SOME MEANS OF REDUCING BACTERIAL PROPAGATION DURING PROLONGED SPACE FLIGHTS

V. V. Borshchenko, M. I. Kozar, F. K. Savinich, and G. V. Shcheglova *In its Rept.* Presented at Soviet Conf. on Space Biol. and Med. 10 Nov. 1966 p 27-31 refs (See N67-13421 04-04) CFSTI: \$4.00

The addition of antibacterial properties to materials used in the manufacture of equipment, clothing, items of personal

hygiene of the astronauts, and in the lining of the occupied spaces of the spacecraft is discussed. Most desirable is the attachment of bactericidal agents in the micromolecules of fibrous polymers by ionic, covalent, or coordinated chemical bond whereby the fibers and fabrics acquire long persisting antibacterial properties. The stability of the antibacterial effect is related to the type of bond between the bactericide, the polymer, and the nature of the bactericide. Preliminary results of antibacterial activity and hygienic properties of textiles chemically bonded with bactericides reveal that cellulose fibers possess a modified activity against staphylococcus aureus. G.G.

N67-13427# Joint Publications Research Service, Washington, D.C.

THE AERO-IONIC COMPOSITION OF PRESSURIZED CABIN AIR AND ITS INFLUENCE ON THE HUMAN BODY

Yu. G. Nefedov, B. V. Anisimov, A. A. Veselova, S. N. Zaloguyev, V. V. Zhuravlev et al *In its Rept.* presented at Soviet Conf. on Space Biol. and Med. 10 Nov. 1966 p 32-46 refs (See N67-13421 04-04) CFSTI: \$4.00

Background sanitary-chemical and physiological data on man during 20 day confinement in a space chamber were analyzed for the influence of ionized air on biological body action. Subjects were exposed to negative, positive, and also both types of aero ions by means of radioactive Steinbock ionizers. Subjects' pulse rate dynamics showed an increase in systolic and minute volumes, acceleration of pulse wave distribution, and the appearance of arrhythmia and extrasystoles during exercise work under the influence of positive aero ions. Prolonged ionization increased oxygen consumption at rest and produced a marked increase in energy expenditure during work. Under deionization conditions at rest, a decrease in oxygen consumption was noted while energy consumption remained the same as in the controls. Analysis of EEG data during respiration of air containing light aero ions showed disturbances of the equilibrium, force, and lability of neural processes; negative ionization intensified the excitatory process and increased its lability. Artificial deionization of the cabin air produced pronounced weakening of the inhibitory and excitatory processes with a significant lability decrease of neural processes. G.G.

N67-13428# Joint Publications Research Service, Washington, D.C.

DEHUMIDIFICATION OF THE AIR IN THE SURVIVAL SYSTEMS OF PRESSURIZED CABINS

N. P. Perfil'yev, V. M. Men'shova, and V. K. Golov *In its Rept.* presented at Soviet Conf. on Space Biol. and Med. 10 Nov. 1966 p 47-50 (See N67-13421 04-04) CFSTI: \$4.00

Proposed is a diffusion method for dehumidifying the air in a pressurized space cabin system for regeneration under conditions of weightlessness. Projected is the diffusion transfer of steam through a porous diaphragm into a sorbent-generator in which it is purified of carbon dioxide, noxious admixtures, and steam. The dehumidified and purified air is then fed into the lower part of the diffusion dehumidifier and finally into the cabin. Steam diffusion through the diaphragm creates a gradient of moisture condensation in the air streams to either side of the porous diaphragm and insures efficient dehumidification through the volumetric velocity of the air, its temperature, steam permeability, porous diaphragm area, and other parameters. G.G.

N67-13429# Joint Publications Research Service, Washington, D.C.

THE INFLUENCE OF CEREBRAL AND CARDIAC OXYGENATION ON PHYSIOLOGICAL FUNCTIONS

Ye. A. Kovalenko, V. L. Popkov, Ye. A. Il'in, V. I. Korol'kov, and I. N. Chernyakov *In its Rept.* Presented at Soviet Conf. on Space Biol. and Med. 10 Nov. 1966 p 51-52 (See N67-13421 04-04) CFSTI: \$4.00

Altitude tests in connection with polarographic determination of cerebral, cardiac, and blood oxygen pressure during centrifuging

were used to simultaneously record the indices of various physiological functions and the dynamics of gases in body tissues during exposure to space flight conditions. Experiments with hypoxic and hyperoxic gas mixtures established correlations between oxygen pressure in brain tissue and heart tissue, as well as between the dynamics of oxygen pressure, carbon dioxide pressure, and helium pressure in the arterial, venous, and capillary blood when the gas environment changed. Experiments with hypercapnic and hypoxic mixtures found a direct correlation between the degree of cerebral oxygenation and the degree of hypercapnia; ascents to different altitudes produced changes in the main physiological functions. A significant deoxygenation in cerebral and cardiac tissues was observed under the influence of accelerations varying in magnitude and duration. G.G.

N67-13430# Joint Publications Research Service, Washington, D. C.

THE BASIC PRINCIPLES OF FORMATION OF THE ATMOSPHERE IN SPACECRAFT CABINS (PHYSIOLOGICAL ROLE OF ATMOSPHERIC PRESSURE)

A. G. Kuznetsov *In its Rept.* presented at Soviet Conf. on Space Biol. and Med. 10 Nov. 1966 p 53-64 refs (See N67-13421 04-04) CFSTI: \$4.00

The biological role of nitrogen in a space cabin atmosphere and its influence on animals were discussed. Rats survived for 100 days in a pure oxygen atmosphere and produced normal offspring. Morphological examination of the animals failed to reveal any signs of toxic poisoning or irritation of lung tissues. Microflora quantity in the cabin atmosphere increased five-fold when the bacterial spectrum shifted to forms of microorganisms that were more resistant and appeared in sporulated forms, aerobes, and fungi. It was concluded that a prolonged stay in a monogas oxygen atmosphere at a total pressure of 198 mm Hg did not influence the animals' life and general condition. An atmosphere where nitrogen is replaced by helium could protect organisms from decompression disorders because of the low solubility coefficient of helium. A helium atmosphere also shifts the range of thermal comfort to higher degrees and thus could eliminate some of the excessive body heat encountered in enclosed atmospheres. G.G.

N67-13431# Joint Publications Research Service, Washington, D. C.

ACCLIMATIZATION TO MOUNTAINS AS A MEANS OF INCREASING CONSTITUTIONAL RESISTANCE TO OXYGEN SHORTAGE AND OTHER EXTREME FACTORS IN SPACE FLIGHT

N. A. Agadzhanian, L. A. Bryantseva, and G. A. Davydov *In its Rept.* Presented at Soviet Conf. on Space Biol. and Med. 10 Nov. 1966 p 65-76 refs (See N67-13421 04-04) CFSTI: \$4.00

Analyses of data obtained both in the mountains and in pressure chamber tests showed that increased constitutional resistance to hypoxia and other extreme factors during prolonged acclimatization in the mountains is the result of activation and intensification of pulmonary respiration, cardiac function, etc. Most important are adaptational changes in cell energy metabolism as indicated by the long persistence of the acclimatization effect. It was concluded that mountain climbing increases also the endurance of prolonged isolation, monotony, temperature fluctuations, humidity, high ultraviolet, infrared and cosmic radiation; astronauts should remain in a mountainous region at an altitude of 3000 to 5000 meters for 40 to 50 days prior to prolonged space flights. G.G.

N67-13432# Joint Publications Research Service, Washington, D. C.

THE POSSIBILITY OF USING THE POLYFUNCTIONAL PROPERTIES OF ZEOLITES IN THE SYSTEM OF PHYSICO-CHEMICAL REGENERATION OF AIR

V. K. Cherkasov, G. S. Ushakova, L. I. Piguzova, A. V. Devyatko, V. I. Solov'yev et al *In its Rept.* presented at Soviet Conf. on Space Biol. and Med. 10 Nov. 1966 p 77-81 (See N67-13421 04-04) CFSTI: \$4.00

Air regeneration and carbon dioxide removal in a space cabin atmosphere was obtained by passing the air through treated zeolite in a successive process of sorption and catalysis. Experimental results showed that several cycles of sorption-catalysis did not change the results much; a correlation between reaction temperature and volumetric rate at a constant degree of conversion was maintained. A line diagram for a physico-chemical air regeneration system is shown that maintains a rigid temperature in the catalytic reactor by checking both processes of sorption and catalysis with the same B-zeolite. G.G.

N67-13433# Joint Publications Research Service, Washington, D. C.

SOME OF THE PHYSIOLOGICAL POSITIONS ON DEVELOPMENT OF THEORETICAL AND PRACTICAL BASES OF ASTRONAUT TRAINING FOR PROLONGED FLIGHTS

I. M. Khazen *In its Rept.* presented at Soviet Conf. on Space Biol. and Med. 10 Nov. 1966 p 82-109 refs (See N67-13421 04-04) CFSTI: \$4.00

The physiological significance of altered gravitation and acceleration as specific stimuli of the neuro-glandular apparatus of the gastrointestinal tract in man was studied. An overall literature review on various acceleration experiments on man and animals as performed elsewhere is included. The author exposed animals to various types of acceleration and found disturbances in the periodic motor activity of their stomachs, a reduced secretion of gastric juice and enzymes from intestinal loops and glands, as well as changes in the permeability of the vascular wall. Observed decreases in lysozyme activity were related to a weakening of antibacterial properties of the digestive juices and to immuno-chemical changes in the body's internal environment. In man, many of the disturbances attributable to acceleration, hypoxia, or certain other extreme factors could be leveled off to a significant degree by intervals between repeated exposure to the same stimulus, through adaptation acquired in high mountain regions, and through general training. G.G.

N67-13434# Joint Publications Research Service, Washington, D. C.

THE INFLUENCE OF RESTRICTED MUSCULAR ACTIVITY OF MAN'S ENDURANCE OF PHYSICAL STRESS, ACCELERATIONS AND ORTHOSTATICS

L. I. Kakurin, R. M. Akhrem-Akhremovich, Yu. V. Vanyushina, R. A. Varbaronov, V. S. Georgiyevskiy et al *In its Rept.* presented at Soviet Conf. on Space Biol. and Med. 10 Nov. 1966 p 110-117 refs (See N67-13421 04-04) CFSTI: \$4.00

Four male subjects maintained strict bed rest for 20 days before undergoing endurance tests to determine the orthostatic factors following restricted muscular activity and the influence of hypokinesia on the motor-cardiac and vasopressor components of the circulatory regulation. Exercise loads after prolonged rest produced decreased work quantities, oxygen consumption, pulse rate acceleration, arteriovenous differences and oxygenation of the blood. Rotation on a centrifuge was also tolerated with much more difficulty than prior to the enforced inactivity and indicated disorders in the functional regulation centers of the cardiac activity. Also discovered were symptoms of decreased lability of the main neural processes. It was concluded that enforced rest and prolonged maintenance of a horizontal position for man resulted in persistent functional disorders of the locomotor area as well as in the visceral system. G.G.

N67-13435# Joint Publications Research Service, Washington, D. C.

SOME ASPECTS OF THE PSYCHOPHYSIOLOGY OF ISOLATION AS APPLIED TO PROLONGED SPACE FLIGHTS

F. D. Gorbov and F. P. Kosmolinskiy *In its Rept.* Presented at Soviet Conf. on Space Biol. and Med. 10 Nov. 1966 p 118-122 refs (See N67-13421 04-04) CFSTI: \$4.00

Research on the influence of isolation and monotonous surroundings on man is being reviewed. Various studies established that prolonged restriction to a small space under conditions of isolation from the outside world blocked sensory input and impaired the ability to think productively. Experiments with partial isolation in which the sense organs were not blocked developed fatigue in the subjects with sleep disorders, difficulty in falling asleep, and awakening independently. After extended isolation, most subjects revealed a difference in sensitivity of their sense organs to distant threshold stimuli and took a relatively long time to recover their athletic former efficiency. G.G.

N67-13436# Joint Publications Research Service, Washington, D. C.

THE CRITERIONAL METHOD OF RESEARCH IN BIOLOGY AND MEDICINE

Yu. N. Sushkov *In its Rept.* Presented at Soviet Conf. on Space Biol. and Med. 10 Nov. 1966 p 123-138 (See N67-13421 04-04) CFSTI: \$4.00

Described is a mathematical model for statistical processing of experimental biological and medical research data, the planning of experiments and diagnoses of diseases, as well as for results obtained on the strength of the first lumbar vertebra of man. This method characterizes each property of a medico-biological object by its own criteria, retains a constant value for the criterion of a group of homogenous objects, measures the numerical value of the criterion of a given object, relates the biological phenomenon to the quantity of variables in the criterion, and evaluates the possibility of performing statistical processing of relatively few experiments. Sample calculations for determining the static strength of the first lumbar vertebra from thirteen random experiments show that with age the strength of the human vertebra diminishes. Mean quadratic and maximum deviations of vertebral strength calculated by the criterion method are lower than corresponding deviation values based on ordinary statistical processing of experimental results. G.G.

N67-13437# Joint Publications Research Service, Washington, D. C.

A METHOD OF EVALUATING THE FUNCTIONAL STATE OF THE DOG'S DENERVATED HEART. PROBLEMS PERTAINING TO INVESTIGATION OF RELIABILITY OF THE HEART

R. M. Bayevskiy, V. P. Demikhov, and N. M. Sharovskaya *In its Rept.* Presented at Soviet Conf. on Space Biol. and Med. 10 Nov. 1966 p 139-142 refs (See N67-13421 04-04) CFSTI: \$4.00

A dog with two hearts, the natural one remaining attached only to the right carotid artery with intact neural connections and the transplanted heart connected to the left carotid and free of neural connections with the central nervous system, was studied by implanted electrodes to obtain data characterizing the contractile function of the myocardium. A method of variation pulsometry analysis showed that the denervated heart operated within a very narrow frequency band, much lower than the heart with intact neural connections. G.G.

N67-13438# Joint Publications Research Service, Washington, D. C.

THE MECHANISM OF THE SEASICKNESS SYNDROME

B. B. Bokhov *In its Rept.* Presented at Soviet Conf. on Space Biol. and Med. 10 Nov. 1966 p 143-144 refs (See N67-13421 04-04) CFSTI: \$4.00

The appearance of various combinations of excitation and inhibition signals in the receptive field of the vestibular analyzer impairs

the normal course of vestibular reactions and leads to sensory disturbances associated with marked vegetative shifts. Training of subjects exposed to Coriolis accelerations diminishes or extinguishes these reactions. The same principle can be applied to disturbances observed during weightlessness: appearance of unfamiliar configurations of excitation due to the disappearance of gravitational forces acting upon the otolithic plate. G.G.

N67-13439# European Atomic Energy Community, Brussels (Belgium).

INVESTIGATIONS BY EMISSION SPECTROGRAPHY ON PLANKTON SAMPLES OF KNOWN BIOLOGICAL COMPOSITION [EMISSIONSSPEKTROGRAPHISCHE UNTERSUCHUNGEN AN PLANKTONPROBEN BEKANNTER BIOLOGISCHER ZUSAMMENSETZUNG]

H.-J. Bielig, H.-L. Schmidt, G. Rohns, and E. Klinger Sep. 1966 29 p refs In GERMAN (EURATOM-015-62-2-BIOB) (EUR-2771.d) CFSTI: HC\$2.00/MF\$0.50

Comparison of the blackening of selected absorption lines in the spectra of plankton ashes and of artificial ashes of known elementary composition, permitted quantitative determination of the amount of the following 13 bioelements: P, Cs, Sr, Ca, Cu, Zn, V, Cr, Mn, Mo, Fe, Co, and Ni. The content of Ag as an accidental trace element has been established. The amount of Si was obtained from the loss of weight after treatment with hydrofluoric acid. There is in nearly all cases parallelism between the frequency of diatoms and the amount of Si in the different plankton samples. Generally the contents of Ca and Sr are found to be in constant relation. The total uptake of bioelements from 1 m² of sea water by the plankton contained in it, lies independently of the collection place, lower than 1% of the amount present. Possible reasons for the higher uptake of Cs and Fe are discussed. An enrichment factor ≥ 100 of bioelements in the plankton ashes has been found only for P, Cs, and Zn; in some cases this has been established also for V, Fe, and Co. Author

N67-13441# Joint Publications Research Service, Washington, D. C.

SIMULATION IN BIOLOGY AND MEDICINE

N. N. Amosov, S. L. Aleyev, and V. G. Mel'nikov, ed. 29 Sep. 1966 177 p refs Transl. into ENGLISH of the book "Modelirovaniye v Biologii i Meditsine" Kiev, Naukova Dumka Press, 1965 p 1-188 (JPRS-37900: TT-66-34328) CFSTI: \$5.00

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17. APPLICATION OF SIMPLE METHODS OF CYBERNETICS TO THE COMPLEX EVALUATION OF THE STATE OF ERYTHROCYTES IN CHRONIC LEUCOSES V. S. Genes and V. D. Sidora p 151-159 refs (See N67-13457 04-04)

N67-13442# Joint Publications Research Service, Washington, D. C.

SIMULATION IN BIOLOGY AND BIOCYBERNETICS

N. M. Amosov and Yu. G. Antomonov *In its* Simulation in Biol. and Med. 29 Sep. 1966 p 2-8 refs (See N67-13441 04-04) CFSTI: \$5.00

Theoretical questions concerning the application of biocybernetics to the solution of medical and physiological problems are discussed. S.C.W.

N67-13443# Joint Publications Research Service, Washington, D. C.

SOME GENERAL PROBLEMS OF THE PHYSIOLOGY OF THE NERVOUS SYSTEM AND CYBERNETICS

N. L. Gorbach and A. A. Bogomolets *In its* Simulation in Biol. and Med. 29 Sep. 1966 p 9-12 (See N67-13441 04-04) CFSTI: \$5.00

Inherent problems associated with the development of mathematical models for studies of the physiology of the higher nervous system are discussed. On the basis of I. P. Pavlov's studies of human behavioral mechanisms, the adoption of the technical principles of switching on and interrupting the nerve connections for processing a nerve current is suggested as a possible approach in the development of more accurate parallels between the functioning of cybernetic machines and between the proposed mechanisms of higher nervous activity. The use of the theory of nerve networks for the simulation of behavior mechanisms on a neuron-synaptic level is discussed. Suggested is the replacement of the single-pulse (binary) code and the instantaneous strongly synchronized interaction of the pulse-frequency alphabet in a sliding (asynchronous) time interval. Thus, the fundamental structure and logical-mathematical framework of the theory remains intact, and to a first approximation, can be widely applied to neurophysiology as an adequate heuristic model. An example which considers the

minimum formal and logical network simulating the effect of engaging and disengaging a stimulus is presented which demonstrates that even a very simple neuron model can clearly indicate some structural and time characteristics and, consequently, some approaches to the study of a given neurophysiological phenomenon. S.C.W.

N67-13444# Joint Publications Research Service, Washington, D. C.

USE OF CYBERNETIC METHODS IN PHYSIOLOGY

N. M. Amosov and V. A. Lishchuk *In its* Simulation in Biol. and Med. 29 Sep. 1966 p 13-23 refs (See N67-13441 04-04) CFSTI: \$5.00

Methods of cybernetics for use in the development of physiological models of diseased organs and systems which focus on the optimum control of medical treatment are described. Emphasized is the use of quantitative methods in diagnostic medicine. S.C.W.

N67-13445# Joint Publications Research Service, Washington, D. C.

CONTROL OF THE ACTIVITY OF SPECIFIC ANATOMIC-PHYSIOLOGICAL STRUCTURES IN THE NORMAL AND PATHOLOGICAL STATES

L. S. Aleyev and S. G. Bunimovich *In its* Simulation in Biol. and Med. 29 Sep. 1966 p 24-29 refs (See N67-13441 04-04) CFSTI: \$5.00

Electrodiagnostic techniques used in the therapeutic stimulation and control of neuromuscular physiological functions are discussed. Considered are bioelectric impulse stimulation methods for the control and study of diseases of the peripheral nerves and methods for the stimulation and control of motor disturbances originating from the central nervous system by means of active bombardment with proprioceptive impulses. The use of signals (myogram) which arise in the organism, such as the frequency and vibrational amplitude of the biopotentials which are fundamental characteristics of muscular bioelectrical activity, is suggested as a possible therapeutic approach in the treatment and study of motor malfunctions resulting from central nervous system disturbances. A single-channel system control device which is based on using the pattern of change in the mean value of the cumulative myogram for determining bioelectric activity of different groups of muscles as a function of their state is described. It is surmised that engineering devices designed according to such principles and operating according to a given program may enable the control of motor reactions in the pathological as well as the normal state. S.C.W.

N67-13446# Joint Publications Research Service, Washington, D. C.

THE MEMORY AS AN OBJECT OF BIOLOGICAL RESEARCH

E. T. Golovan', K. A. Ivanov-Muromskiy, A. N. Luk, and V. S. Starinets *In its* Simulation in Biol. and Med. 29 Sep. 1966 p 30-45 refs (See N67-13441 04-04) CFSTI: \$5.00

Attempts to develop a storage memory in artificial systems with a search strategy similar to that of the human brain are discussed. Focused upon is the development of systems with a substantial information capacity and a minimal access time for information retrieval from storage. The importance of studies of human brain functions in the development of memory devices is emphasized. Fundamental characteristics of human memory and the relationship of these characteristics to the problem of random access are discussed and models which consider the fundamental properties of memory are presented to illustrate proposed approaches to the simulation of memory characteristics. S.C.W.

N67-13447# Joint Publications Research Service, Washington, D. C.

A NONLINEAR MODEL FOR THE EXCITATION OF NERVE TISSUE

Yu. G. Antomonov *In its Simulation in Biol. and Med.* 29 Sep. 1966 p 46-57 refs (See N67-13441 04-04) CFSTI: \$5.00

The applicability of a nonlinear, heterogeneous differential equation with a discontinuous coefficient in the development of a mathematical model for the simulation of the excitation properties of nervous system elements (neurons and nerve fibers) and the general properties of larger units of the nervous system and cerebral cortex (visual and acoustic analyzers) is discussed. A switching function controlling the sign of the unique coefficient was chosen on the basis of the energetic properties of nerve tissue. A mathematical model which describes the electrotonus, the action potential, and the absolute refractive phase was studied by simulating a continuous action on a computer. Results indicated that the model adequately described the properties of nerve tissue. S.C.W.

N67-13448# Joint Publications Research Service, Washington, D. C.

MATHEMATICAL STUDY OF A MODEL FOR THE EXCITATION OF NERVE TISSUE

A. B. Kotova, I. D. Ponomareva, and L. I. Tushenkov *In its Simulation in Biol. and Med.* 29 Sep. 1966 p 58-69 refs (See N67-13441 04-04) CFSTI: \$5.00

A nonlinear, first-order differential equation with a discontinuous coefficient is proposed as a model of a nerve tissue:

$$u' = \text{sgn } Wau = v,$$

$$W = E_n - \int (v - v_n + v')dt + \int (u + u')x dt,$$

where v is the exciting tension, u is the potential of the nerve tissue, E_n is the analog of the threshold value of the internal energy integral, and v_n is the tension threshold. It is known that a dynamic system described by the equation $u' = \text{sgn } Wau = v$, is an analog of the excitation of nervous tissue; that is, in such a system exists characteristic threshold mechanisms of adaptation, threshold summation, transformation rhythm, frequency dependence of the responses to the magnitude of the excitation stimulus, and a series of other factors. The objective of the mathematical study is to show that these properties emerge from the special features of the differential equation $u' = \text{sgn } Wau = v$; that is, they are determined by those energy considerations which are contained in the choice of the switching function $W = E_n - \int (v - v_n + v')dt + \int (u + u')x dt$ for the coefficient of the differential equation. Results of qualitative studies of phase trajectories, and movement of the action potential as a function of the switching function are presented to demonstrate the applicability of differential equations with discontinuous coefficients as mathematical models for biological systems. S.C.W.

N67-13449# Joint Publications Research Service, Washington, D. C.

RHYTHM OF A NEURON MODEL

A. B. Kotova, I. D. Ponomareva, L. I. Tushenkov, and Yu. G. Antomonov *In its Simulation in Biol. and Med.* 29 Sep. 1966 p 70-80 refs (See N67-13441 04-04) CFSTI: \$5.00

An analytical study of the rhythm of a neuron model which was performed on a nonlinear MN-7 simulation computer is reported. The model was based on the following nonlinear heterogeneous first-order differential equation with a discontinuous coefficient:

$$u' = \text{sgn } Wau = v,$$

$$W = \phi - \int (v - v_n + v')dt + \int (u + u')dt,$$

where v is the exciting stimulation, u is the neuron potential, ϕ is the analog of the threshold value of the external energy integral, and v_n is the stimulation threshold. The switching function $W = \phi - \int (v - v_n + v')dt + \int (u + u')dt$ was also chosen on the basis of the energetic balance of the nervous tissue. Demonstrated is the use of the proposed model in studies of the spontaneous rhythm of neurons with single inputs, multiple inputs, and feedback. On the basis of these studies it is concluded that: (1) A mathematical model constructed on the basis of energy considerations makes it possible to obtain the properties of neurons of various types (active, passive, etc.); (2) The rhythm of spontaneous discharges depends on the value v which is the analog of the indicator for the functional state; (3) The model of a passive neuron with a potential input may serve as transformer of the amplitude of the incoming signal to the frequency; (4) A connection of the output of the neuron model to an excitation input increases the discharge frequency; and (5) A connection of the output of the neuron model to a retardation input decreases the frequency of the discharges. S.C.W.

N67-13452# Joint Publications Research Service, Washington, D. C.

THE HEART AS A CYBERNETIC SYSTEM

V. A. Lishchuk, O. I. Lissova, and S. A. Patskina *In its Simulation in Biol. and Med.* 29 Sep. 1966 p 98 106 refs (See N67-13441 04-04) CFSTI: \$5.00

Consideration is given to some problems concerning heart simulation, whereby the heart is regarded as a functionally complete system and its model is regarded as a behavioral algorithm. In addition, separate treatment is given to a complex of four muscular pumps, a system of independent automatic control, and a system of central control which is also automatic. The problems involved in determining an algorithm of heart behavior on an informational level are discussed in four stages: (1) determining the quality and quantity of the required information; (2) obtaining this information from experiments; (3) processing and analysis of the data; and (4) perfecting the obtained model by comparison with the object. R.N.A.

N67-13453# Joint Publications Research Service, Washington, D. C.

EXTRASYSTOLIC ALLORHYTHMIA (MATHEMATICAL MODEL)

V. A. Lishchuk, S. A. Patskina, B. L. Palets, and I. L. Lissov *In its Simulation in Biol. and Med.* 29 Sep 1966 p 107-116 refs (See N67-13441 04-04) CFSTI: \$5.00

A mathematical model is proposed which explains all forms of an extrasystolic allorhythmia from a unique point of view as a result of the same process. The formalization of the description makes it possible to exclude the ambiguous statements of the problem made by various authors. The frequency of impulse generation by an excitation center of the heart depends on the frequency and on the form of respiration. This dependence can change the form of an allorhythmia to a significant extent. For refinement of the proposed model for an allorhythmia, it makes sense to consider the dependence of the contraction frequency of the heart on the respiration, for instance by using the transmission function of Klains. Some experimental and clinical data make it possible to assume that in individual cases the impulsation periods of the sine center and the pathological center are interdependent. R.N.A.

N67-13454# Joint Publications Research Service, Washington, D. C.

PUNCHED CARDS IN THE ANALYSIS OF PHONOCARDIOGRAMS

V. G. Mel'nikov *In its Simulation in Biol. and Med.* 29 Sep. 1966 p 130-139 refs (See N67-13441 04-04) CFSTI: \$5.00

Phonocardiography is one of the most important diagnostic methods in the study of the cardiovascular system. The interpretation and statistical analysis of phonocardiographic data requires the extraction of the desired information from a vast amount of different data Machines, which automatically process the phonocardiographic data coded on punched cards, are of considerable help in solving this problem. Problems related to the setting up of a punched card file for phonograms are discussed. R.N.A.

N67-13455# Joint Publications Research Service, Washington, D. C.

MULTICHANNEL REACTION METHOD IN THE CONTROL OF SOME MOTOR FUNCTIONS

L. S. Aleyev and S. G. Bunimovich *In its* Simulation in Biol. and Med. 29 Sep. 1966 p 140-146 (See N67-13441 04-04) CFSTI: \$5.00

Research was conducted to develop a model of a device for the control of motor reactions in men and animals. The research involved: (1) a study of the electrical activity of nerve-muscular structures to establish a stimulation law depending on the degree of contraction; (2) a study of the interaction of muscles and groups of muscles in the fulfillment of motion; (3) a search for an optimum stimulus, i.e., a signal which brings about a threshold contraction at a minimum energy expenditure and with a minimum sensation of pain; (4) and a study of problems related to the optimum control of the motor systems of the organism, including the optimum spatial distribution of electrodes taking up and sending out signals and the establishment of algorithms for the optimum space-time input of control signals. A detailed description of the operation principle of the device is presented. R.N.A.

N67-13456# Joint Publications Research Service, Washington, D. C.

SOME PROBLEMS IN THE ANALYSIS OF MEDICO-PHYSIOLOGICAL STUDIES BY MATHEMATICAL METHODS USING COMPUTERS

Ye. A. Shkabara and M. A. Kulikov *In its* Simulation in Biol. and Med. 29 Sep. 1966 p 147-150 (See N67-13441 04-04) CFSTI: \$5.00

An algorithm and a program were developed for the computer analysis of some physiological characteristics and a system of devices were set up for coding, recording, and computer input of medico-biological experimental data. The system can record the physiological characteristics of an organism during an experiment on magnetic tape and enter the obtained experimental data into a computer for analysis. The system can analyze impulse characteristics such as the impulse activity of the neuron, as well as continuous characteristics such as electroencephalograms, electrocardiograms, blood pressure curves, etc. Some problems related to a specific application of this method, i.e., a mathematical analysis by computer of the impulse activity of intermediate neurons of the brain stem and the spinal cord, are discussed. R.N.A.

N67-13457# Joint Publications Research Service, Washington, D. C.

APPLICATION OF SIMPLE METHODS OF CYBERNETICS TO THE COMPLEX EVALUATION OF THE STATE OF ERYTHROCYTES IN CHRONIC LEUCOSES

V. S. Genes and V. D. Sidora *In its* Simulation in Biol. and Med. 29 Sep. 1966 p 151-159 refs (See N67-13441 04-04) CFSTI: \$5.00

A study was conducted to distinguish between the stages of chronic myeloid leukoses and lymphoid leukoses by means of the erythrocyte and hemoglobin content (EH) characteristic, the mass of circulating erythrocyte (MCE) characteristic, and a combination of the two. The study shows that the combined use of EH and MCE characteristics can better distinguish between the

stages of chronic leukoses than by considering each of the characteristics separately. The hypothesis that the EH and MCE characteristics carry to a certain degree different information about the erythrocytes was confirmed. Moreover, the MCE characteristic provides a considerable amount of information which is applicable to the determination of the clinical severity of chronic leukoses. The measurement of the information contained in each characteristic and in their combination was made by using methods of mathematical statistics and cybernetics. R.N.A.

N67-13470# Michigan Univ., Ann Arbor. Dept. of Radiology.
CURRENT AND FUTURE NEEDS FOR REMOTE SENSOR DATA IN MEDICINE

Walter M. Whitehouse *In its* Proc. of the 4th Symp. on Remote Sensing of Environment Jun. 1966 p 55-61 refs (See N67-13461 04-14) CFSTI: HC\$8.75/MF\$3.50

Applications of remote sensor radiant energy spectra to medical subspecialty fields are reviewed. The current and future needs for the evaluation of sensor data are discussed under the dichotomy: the spontaneously emitted infrared radiation from the patient, and the transmission or reflection by anatomic structures of ultra sound from a source placed close to the patient. Clinical thermography, or the recording of the infrared emissions from the skin of human subjects, in the following areas of practical interest are discussed: mammography, peripheral vascular disease, intracranial disease, obstretical problems, trauma and inflammatory disease, and basic research. Thermogram relevance, and ionizing radiation in the investigation of obstretical problems are briefly noted. R.LI.

N67-13491# Agricultural Research Service, Weslaco, Tex. Southern Plains Branch.

FACTORS AFFECTING LIGHT REFLECTANCE OF COTTON

James R. Thomas, Victor I. Myers, M. D. Heilman, and C. L. Wiegand *In* Mich. Univ. Proc. of the 4th Symp. on Remote Sensing of Environment Jun. 1966 p 305-312 refs (See N67-13461 04-14) CFSTI: HC\$8.75/MF\$3.50

Field and greenhouse experiments were conducted to determine the effects of plant height, percentage of ground cover, and soil salinity on the spectral characteristics of cotton. Comparison of Ektachrome infrared and black-and-white infrared photographs indicated that salt-affected cotton could be detected earlier in the season with the Ektachrome infrared film. Density of both film types was significantly correlated with plant height, percentage of ground cover, and salinity. The degree of correlation changed as the crop matured, and with the type of filter used in measuring the film density. Reflectance of individual leaves was affected by leaf age, moisture content, nitrogen fertilization, and salinity. An increase in the total moisture content or relative turgidity of the leaf significantly decreased infrared reflectance, while salt increased reflectance. Author

N67-13559# European Organization for Nuclear Research, Geneva (Switzerland).

EXPERIENCE WITH A LINEAR ENERGY TRANSFER (LET) CHAMBER AT CERN

T. R. Overton 24 Oct. 1966 42 p refs (CERN-66-33)

Basic theoretical ideas in conjunction with the physical characteristics of chamber response are portrayed in this document, which is intended to serve as a guide for future users of the linear energy transfer (LET) chambers. General ideas of the LET chamber are described, and technical details are given on path length distribution and dose measurements. The measurement of the LET-dose spectra is considered to be an important addition to the available methods for radiological protection, although the complexity of the method precludes its general application. Previous studies in this field are briefly outlined, and the design, operation, performance optimization, and practical improvements listed.

Some emphasis is placed on diameters of 1-2 μ (~chromosome dimensions), and the spectra were taken at TE gas pressures which simulated approximately this size of unit density sphere. R.L.

N67-13618# System Research, Ltd., Richmond (England).

A CYBERNETIC MODEL OF HUMAN DATA PROCESSING

Gordon Pask Repr. from Excerpta Med., Ser. 49 Presented at the Proc. of the Intern. Union of Physiol. Sci. 22d Intern. Congr., Leiden, 1962

(Contract AF 61(052)-640; AF 61(052)-402)
(AD-636313)

A comparison is made of systems in which information flow and computation takes place, and the experimental method derived from the model is described. A hybrid system in which it is possible to make precise and testable statements about the information flow or computation that underlies the behavior of man as a whole is discussed, and the required conditions are identified. The experimental method is outlined for simple and more elaborately structured skills. Families of learning curves are plotted. It is concluded that the chief information derivable from an adaptively stabilized system is a set of numerical measurements obtained with the assurance that the relation between the subject and the experimental environment is held invariant. N.E.N.

N67-13623# Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.

PHYSIOLOGICAL DATA TELEMETRY SYSTEM

N. C. Hoitink and N. S. Porter Jul. 1966 12 p

(Contract AT(45-1)-1830)
(BNWL-214) CFSTI: \$1.00

A physiological data telemetry system, comprising both commercial and developed solid state circuits, was developed and is being used to monitor, on a continuous basis, body temperatures and heart function (ECG data) of two maintenance technicians working under high temperature conditions. The completed system includes two miniature transmitters, ECG electrodes, thermistor temperature probes, two FM receivers, a developed demodulator unit, and a dual channel recorder. Satisfactory performance is being achieved over 200 ft ranges in general field operation.

Author (NSA)

N67-13636# Atomic Energy Commission, Idaho Falls, Idaho. Health and Safety Div.

DOSE TO VARIOUS BODY ORGANS FROM INHALATION OR INGESTION OF SOLUBLE RADIONUCLIDES

D. F. Bunch Aug 1966 28 p refs

(IDO-12054) CFSTI: \$2.00

The International Commission on Radiological Protection has published two reports that provide biological data on the retention of various radionuclides in the body. These data were used to compile a list of dose conversion factors so that rapid approximations of dose from inhalation or ingestion of soluble radioactive materials may be made. Included are tables of rem per curie inhaled, rem per curie-sec/m³ (time integrated concentration), rem per curie in the organ of interest, and rem per curie ingested. In addition, the parameters and values used to derive these factors are presented and discussed.

Author (NSA)

N67-13638# Edgerton, Germeshausen and Grier, Inc., Santa Barbara, Calif.

DESIGN OF A SHIELDED SOURCE FOR THE IRRADIATION OF NATURAL ANIMAL POPULATIONS

A. C. Lucas, Z. G. Burson, and R. E. Lagerquist Oak Ridge, Tenn., AEC, Feb. 1966 44 p refs

(CEX-63.10) CFSTI: \$1.00

This report discusses the design of a radiation source and shield that provides dose rates in the range 0.38 to 0.75 R/hr over a 20-acre circular plot. Calculations of the primary and secondary radiations contributing to the dose distribution at the soil surface were utilized in predicting the amount of shielding necessary to provide a uniform dose rate. The source is placed on a 50-foot tower in the center of the irradiation site. A manually operated winch is used to raise and lower the source.

Author (NSA)

N67-13650# Royal Air Force, Farnborough (England). Inst. of Aviation Medicine.

THE AIR VENTILATED SUIT: FURTHER EXPERIMENTS BY TWO DIFFERENT METHODS TO STUDY THE GAIN IN THERMAL INSULATION DUE TO AIR FLOW THROUGH THE MATERIAL

K. E. Spells and O. J. Blunt London, Flying Personnel Res. Comm., Jul. 1965 43 p refs

(FPRC-1233) CFSTI: HC \$2.00/MF \$0.50

Various arrangements of air-ventilated jackets, including assemblies lined with a cloth of low permeability, have been investigated. The percentage decrease in the original (unventilated) rate of heat loss produced by ventilation is used as a measure of the advantage due to the operation of the dynamic insulation effect. A method of measuring rates of heat loss has been developed which depends on observation of the rate of supply of energy to the thermostatically controlled water bath protected by the air-ventilated jacket. This method has been compared with the former (heat flow disk) method using the same jacket assemblies; its present defects have been indicated and suggestions for its improvement made. The existence of the dynamic insulation effect has been established beyond reasonable doubt.

Author

N67-13651# California Univ., Davis. School of Veterinary Medicine.

RADIOBIOLOGY LABORATORY Annual Report, Fiscal Year 1966

Jun. 1966 69 p refs

(Contract AT(04-3)-472)

(UCD-472-113) CFSTI: HC \$3.00/MF \$0.75

Summary reports are given on various topics in the fields of X-irradiation effects and radionuclide toxicity. Subjects covered include historical introduction, clinical observations, reproductive ability, survival, and pathological findings in X-irradiated beagles; historical development of radionuclide toxicity studies; clinical observations on colony status of dogs administered strontium 90 and radium 226; hematological changes in beagles administered strontium 90 and radium 226; skeletal dosimetry of beagles fed strontium 90; vitamin retention in prepared dog food as influenced by storage time; and preliminary studies on lithium fluoride radiation dosimetry.

L.E.W.

N67-13652# Atomic Energy Commission, Idaho Falls, Idaho. Health and Safety Div.

CONTROLLED ENVIRONMENTAL RADIOIODINE TESTS Progress Report

D. F. Bunch ed, Aug. 1966 39 p refs

(IDO-12053; PR-2) CFSTI: HC \$2.00/MF \$0.50

The Controlled Environmental Radioiodine Test (CERT) program consists of a series of field releases of various types of radioiodine over different vegetation and under various meteorological conditions to obtain data on the hazard of iodine and on the quantitative movement of iodine through the air-vegetation-cow-milk-human chain. Results of the sixth and seventh tests in the series and laboratory experiments to support the field studies are reported. The laboratory experiments consisted of measuring the deposition and retention of the various forms of radioiodine on vegetation in an environmental chamber and the development of sampling

techniques. Results of field studies using ^{131}I as tracer indicated that the deposition of methyl iodide (CH_3I) on grass is at least a factor of 100 less than I_2 (iodine vapor) under similar conditions and that the dose potential (defined as the ratio of standard-man ingestion dose to inhalation dose) is at least a factor of 400 less. The metabolic behavior of CH_3I in humans appeared to be very similar to other chemical forms of iodine. Information was obtained on the movement of radioiodine under typical late-fall or early-winter conditions. An analytical model was derived which makes possible rapid and reasonably accurate assessment of levels of ^{131}I activity in milk as well as the expected thyroid dose. The dose potential was evaluated as a function of season and age groups, and it is estimated that the probable ingestion dose to children under typical adverse weather conditions is about 400 times that for the standard-man inhalation dose. Results indicated that iodine concentrations in milk may be relatively greater in fall than in spring or summer months, probably due to an increased rate of secretion of iodine in milk. NSA

N67-13658# Atomic Energy Commission, New York. Health and Safety Lab.

FALLOUT PROGRAM Quarterly Summary Report, 1 Mar.-1 Jun. 1966

Edward P. Hardy, Jr. and Joseph Rivera 1 Jul. 1966 523 p refs

(HASL-172) CFSTI: HC \$8.00/MF \$2.25

Current data are presented from the HASL Fallout Program, Environmental Science Services Administration, National Radiation Laboratory in New Zealand, Argonne National Laboratory, and the EURATOM Joint Nuclear Research Center. Radionuclide levels in fallout, milk, tap water, diet, surface, and high-altitude air, are given in tabular form. The initial section includes interpretive reports and data summaries covering the following topics: strontium-90 concentrations in the waters of Lake Michigan and a comparison with the cumulative land deposit; a summary of the air filter samples collected during 1965 at balloon-borne altitudes; the results of an experiment to determine how much fallout debris is collected on the balloon-borne filtering devices during ascent and descent; stratospheric strontium-90 concentrations from January 1963 and predictions to August 1968; plutonium-238 in the stratosphere from SNAP-9A; vertical profiles of particulate radioactivity in the atmosphere during February 1965; gross gamma measurements in surface air from July 1965 to February 1966; global deposit of strontium-90 through 1965 and prediction for 1966; monthly averages of strontium-90 fallout and precipitation by 10° bands of latitude; and strontium-90 in human vertebrae sampled in 1965. A bibliography of recent publications related to radionuclide studies is included. Author (NSA)

N67-13673*# New York Medical Coll., N. Y.

HISTOPATHOLOGY OF THE CHIMPANZEE EAR Final Technical Report, 1 Mar. 1964-31 Dec. 1965

E. L. House, M. E. Jacobs, B. Pansky et al Holloman AFB, N. Mex., Aeromed. Res. Lab., Jun. 1966 107 p refs

(NASA Order R-25; Contract AF 29(600)-4563; Proj. 6892)

(NASA-CR-80719; ARL-TR-66-15) CFSTI: HC \$4.00/MF \$0.75 CSCL 06S

Four female and two male chimpanzees were secured in various positions on a Daisy Decelerator and subjected to forces ranging from 54 to 180 G. It was found that forces in excess of 54 G may rupture the tympanic membranes and cause subepithelial hemorrhages in the middle ear. The majority of cases showed proteinaceous material, with or without cells in the petrous air spaces. Discussed are the effects on the pericarotid venous plexus, the superior and posterior semicircular canals, the cupulae of the cristae ampullaris, the hair processes, the otolithic membranes, the sacculle, the lumina of the vestibular apparatus, and the cochlear ducts. Although there seems to be considerable individual variation in ability to withstand these forces, neither age, sex nor weight

appear to directly influence the results. The possible sources for the materials found both in the air cells and labyrinth are discussed.

Author

N67-13676*# Ohio State Univ. Research Foundation, Columbus, Ohio. Dept. of Medicine.

THE EFFECTS OF GANGLIONIC AND ADRENERGIC BLOCKADE ON THE CIRCULATION OF THE YOUNG CHIMPANZEE Final Technical Report, 1 Oct. 1963-30 Apr. 1965

Clyde D. Schoenfeld, Arnold M. Weissler, Vernon L. Carter, and James V. Warren Holloman AFB, N. Mex., Aeromed. Res. Lab., Mar. 1966 23 p refs

(NASA Order R-25; Contract AF 29(600)-4385; Proj. 6892)

(NASA-CR-80716; ARL-TR-66-7) CFSTI: HC \$1.00/MF \$0.50 CSCL 06P

The role of the autonomic nervous system in circulatory control in young chimpanzees was evaluated through the use of selected autonomic blocking agents. Ganglionic blockade resulted in decreases in cardiac output, heart rate and arterial pressure. Beta adrenergic blockade resulted in similar decreases in cardiac output and heart rate, while arterial pressure was unchanged. Alpha adrenergic blockade caused a decrease in arterial pressure and peripheral resistance; heart rate rose and cardiac output showed no consistent change. These changes indicate that a significant amount of sympathetic-adrenergic stimulation of the circulation is present in the young resting chimpanzee. When compared to data obtained in resting humans, qualitatively similar changes are found for cardiac output and arterial pressure. It is suggested that in the chimpanzee an effective autoregulatory mechanism for control of arterial resistance exists, independent of the autonomic or adrenergic systems. Author

N67-13734# Vanderbilt Univ., Nashville, Tenn.

GLYCIDIC ESTERS AND/OR ORGANIC DISULFIDES AND RELATED SUBSTANCES, AS SOURCES OF ANTIRADIATION DRUGS Interim Research Report, 1 Oct.-31 Dec. 1965

J. D. Buckman, R. B. Barbee, M. Bellas, P. R. Engelhardt, and P. M. Giles et al [1966] 29 p refs

(Contract DA-49-193-MD-2030)

(AD-630199) CFSTI: HC \$2.00/MF \$0.50

Research continued on cyclic disulfides and their oxidation products and on used of the latter for synthesis of antiradiation drugs. Syntheses were continued of compounds of the type $n\text{-C}_{10}\text{H}_{21}\text{NH}(\text{CH}_2)_2\text{SS}(\text{CH}_2)_n\text{X.HCl}$. Investigation has begun of compounds of the structure $\text{RR}'\text{C}(\text{OH})\text{S}(\text{CH}_2)_2\text{NH}_3(+)\text{Cl}(-)$. A number of studies were made of the compound $p\text{-C}_7\text{H}_7\text{SO}_2\text{N}=\text{C}(\text{SK})_2$. Reaction of thiolsulfonates with dithio acids proved unpromising for synthesis of structures of the form $\text{RC}(\text{S})\text{SSR}$. Disproportionation studies of a number of carbonyl and thiocarbonyl disulfides were completed and correlations were drawn with structural features. Research was initiated on the use of sulfonyl sulfides ($\text{RSO}_2\text{-Sx-SO}_2\text{R}$) for preparing antiradiation drugs. Synthetic work directed toward preparation of 2,5 bis-(2-aminoethylthio)-1,4-benzenedicarboxylic acid, a bis analog of the active drug o-(2-aminoethylthio)benzoic acid (VU26), was continued. TAB

N67-13780# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SECOND GROUP SPACE FLIGHT, AND CERTAIN RESULTS OF FLIGHTS OF SOVIET COSMONAUTS ON THE "VOSTOK" SHIPS

A. D. Voskresenskiy, O. G. Gazenko, and D. G. Maksimov comp. 18 Aug. 1965 197 p refs Transl. into ENGLISH of the book "Vtoroy Gruppovoy Kosmicheskoy Polet i Nekotoryye Itogi Poletov Sovetskikh Kosmonavtov Na Korabyakh "Vostok" Moscow, Izd. Nauka, 1965 p 1-228

(FTD-MT-65-256; TT-65-62984; AD-619384) CFSTI: HC \$5.00/MF\$1.25

Contents: General conditions of flight and flight assignment; Physiological-hygienic appraisal of the life-support systems and safety measures; Air regeneration and conditioning in the cabins of ship-satellites; Hygienic appraisal of clothes donned under pressure suit; Feeding and water supply; Medical control of physical preparation of cosmonauts; Investigation with creation of brief weightlessness on an aircraft; Investigations on a centrifuge; Investigation of vestibular reactions; Influence of high temperatures; Psychological investigations in conditions of isolation; Working activity of the cosmonauts; Results of Investigations in Flight; Postflight Medical Inspection of Cosmonauts. TAB

N67-13790* National Aeronautics and Space Administration, Washington, D. C.

EFFECT OF IONIZING RADIATION ON THE FUNCTIONING OF THE VESTIBULAR ANALYZER [VLIYANIYE IONIZIRUYUSHCHEGO IZLUCHENIYA NA FUNKTSIYU VESTIBULYARNOGO ANALIZATORA]

N. V. Moskovskaya Dec. 1966 7 p refs Transl. into ENGLISH from Otorinolaringol. (Moscow), v. 21, 1960 p 59-62 (NASA-TT-F-10498) CFSTI: HC \$1.00/MF \$0.50 CSCL 06R

Studies on the function of the vestibular analyzer in patients subjected to the action of ionizing radiation are presented. Ionizing radiation increases the excitability of the function of the vestibular analyzer during the institution of radiation therapy, as well as after a lapse of 5-7 years following such therapy. The elevated functional excitability of the vestibular analyzer is apparently due to weakening of the inhibitory action of the cerebral cortex, which is substantiated by chloral hydrate tests. Author

N67-13806* Joint Publications Research Service, Washington, D. C.

EFFECT OF HIGH AND LOW AFFERENTATION ON HUMAN ORGANISM FROM VIEWPOINT OF SPACE PSYCHOPHYSIOLOGY

F. D. Gorbov, F. P. Kosmolinskiy, and V. I. Myasnikov 13 Dec. 1966 8 p refs Transl. into ENGLISH from Vopr. Psikhologii (Moscow), No. 5, 1966 p 67-71 (JPRS-39077; TT-66-35500) CFSTI: \$1.00

Studied was the training of the body loop, the man-spacecraft loop, and the man-spacecraft-environment loop on the basis of flight tests, centrifugal experiments, and special simulator experiments. Information excess experiments, simulating various forms of communication with an intruding noise level close to that of the useful signal, were compared with results obtained from sensory deprivation experiments. Psychophysiological analysis of data obtained during refuelling operations showed a marked neural-emotional stress in the pilot under conditions of information overload and sensory deprivation. Optimal work, rest periods, and special motor activity schedules were recommended for astronaut conditioning on long duration flights; in addition, an intake of vitamins was proposed to increase their general physiological tone and to reduce neural stress under sensory overload conditions. G.G.

N67-13807* Joint Publications Research Service, Washington, D. C.

THE EFFECTS OF COMBINED SPACE FLIGHT FACTORS ON SOME BODILY FUNCTIONS

G. M. Frank, N. N. Livshits, M. A. Arsen'yeva, Z. I. Apanasenko, L. A. Belyayeva et al 16 Dec. 1966 26 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Biol. (Moscow), no. 5, Sep. 1966 p 625-642

(JPRS-39159; TT-66-35582) CFSTI: \$1.00

Examined were the effects of acceleration, vibration, ionizing radiation, and the combined action of dynamic and radiation factors

on some functions and the oxidative metabolism of the central nervous system and on mitosis in hematopoietic tissues (1) Acceleration changed cerebral circulation markedly as a result of the interaction of mechanical and physiological factors; however, the resistance of cerebral circulation was increased by training (2) Vibration intensified the oxidative metabolism and inhibited various divisions of the nervous system, (3) Combined acceleration and vibration effects reduced mitotic activity in bone marrow cells for 30 days; (4) Ionizing radiation and the investigated dynamic factors combined had an unidirectional effect on the oxidative metabolism in brain tissues and on mitosis in the hematopoietic system. Changes in CNS functions were complex and varied for sometime after exposure to a combination of factors. G.G.

N67-13808* Joint Publications Research Service, Washington, D. C.

STUDIES ON THE MUTAGENIC ACTIVITY OF A NEW GROUP OF CHEMICAL COMPOUNDS AND THEIR GENETIC EFFECT WHEN COMBINED WITH IONIZING RADIATION

L. A. Suykova 16 Dec. 1966 10 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Ser. Biol. (Moscow), no. 5, Sep. 1966 p 739-743

(JPRS-39158; TT-66-35581) CFSTI: \$1.00

Mutagenic effects of the alkylating compounds K₃₂, C₃₂, K₁₆, and ethylenimine on the second generation (M₂) of barley were studied by using chlorophyll mutation as criterion. These compounds were β-bis-chlorethyl or ethylenimine derivatives which have shown antitumor activity on ascitic carcinoma cells. Air dried barley seeds were exposed to gamma rays of a Co⁶⁰ source as well as treated in solutions of the above mutagens (pH 7.5) for 24 hours. Variation of the experiment involved radiation and treatment combining a chemical mutagen and irradiation. Results showed that the alkylating compounds are active mutagens and suitable for plant selection; the most active, K₃₂, produced 16 to 42% changed seeds of wide mutation spectrum. The combined action of chemical mutagens and radiation did not produce a distinct summational effect. G.G.

N67-13817* United Kingdom Atomic Energy Authority, Harwell (England), Health Physics Div.

EVALUATION OF AIRHOODS AND AIRBLOUSES USED AT A.E.R.E.

D. C. Stevens and J. B. Ritchie Sep. 1966 17 p refs (AERE-R-5184) HMSO: 3s 6d

The penetration of a sodium chloride aerosol into airhoods and airblouses has been measured at various flow rates of compressed air. A flow of 5 cfm is required to ensure a protection factor of 1000 (penetration <0.1%). A direct reading prototype flow meter has been made which can be permanently inserted into the airline near the hood or blouse so that a wearer can adjust his air flow as required. Measurements are also reported of the noise levels in airhoods and blouses and simple means of reducing these have been investigated. These noise levels can be reduced by as much as 15 dB by the insertion of simple filter pads at the air inlet. Author

N67-13835* National Aeronautics and Space Administration, Washington, D. C.

COMPARATIVE ANALYSIS OF THE EFFECT OF GRAVITATIONAL STRESS AND HYPOXIA ON OXYGEN TENSION IN BRAIN TISSUES [SRAVNITEL'NYY ANALIZ VLIYANIYA GIPERVESOMOSTI I GIPOKSII NA NAPRYAZHENIYE KISLORODA V TKANYAKH MOZGA]

B. M. Savin Sep. 1966 11 p refs Transl. into ENGLISH from Patol. Fiziol. i Obshchaya Patol. (USSR), v. 61, 1966 p 19-23 (NASA-TT-F-10288) CFSTI: HC \$1.00/MF \$0.50 CSCL 06S

It is sufficiently known from literature, that g-forces cause marked shifts in the functional state of the central nervous system, usually associated with the phenomena of acute hypoxia caused

by disorders of cerebral circulation. Here, the authors came to the opinion, that hypoxia is one of the factors in the pathogenesis of disorders caused by accelerations. For experimental purposes, rabbits and cats were exposed to various gravitational stresses and the pO₂ was measured. The results are given. Author

N67-13839* # National Aeronautics and Space Administration, Washington, D. C.

INVESTIGATION OF THE ENZYMATIC SYNTHESIS OF POLYADENINE IN COACERVATES [IZUCHENIYE FERMENTATIVNOGO SENTEZA POLIADENINA V KOATSERVATAKH]

K. B. Serebrovskaya Dec. 1966 6 p refs Transl. into ENGLISH from the book "Problemy Evolyutsionnoy i Tekhnicheskoy Biokhimi" 1964 p 127-130

(NASA-TT-F-10440) CFSTI: HC \$1.00/MF \$0.50 CSCL 06A

This article investigates the spontaneous formation of coacervate droplets from high-molecular compounds, and their conversion into continuous systems. The experiments confirm A. I. Oparin's hypothesis that polymers of proteins and nucleic acids synthesized in the primeval ocean could not remain in solution, and separated out in the form of coacervate droplets. Author

N67-13840* # National Aeronautics and Space Administration, Washington, D. C.

A STUDY OF THE NEED OF TWO SPECIES OF DUNALIELLA ALGAE FOR MINERAL AND ORGANIC COMPONENTS OF THE MEDIUM [IZUCHENIYE POTREBNOSTI DVUKH VIDOV VODOROSLEY DUNALIELLA V MINERAL'NYKH I ORGANICHESKIKH KOMPONENTAKH SREDY]

Ye. S. Mil'ko Dec. 1966 11 p refs Transl. into ENGLISH from Vestn. Mosk. Univ., Ser. Vi: Biol. Pochvoved. (Moskow), v. 1, 1962 p 18-24

(NASA-TT-F-10455) CFSTI: HC \$1.00/MF \$0.50 CSCL 06C

The optimal concentrations of salts found in the medium for *D. salina* and *D. viridis* were: NaCl=60 g/liter; NaNO₃=0.5-1 g/liter; K₂HPO₄=0.02-0.25 g/liter; FeC₆H₅O₇·3H₂O=10 mg/liter. Passing air with 5% CO₂ through the medium increases the algae yield by a factor of 2. In 10 days, with the addition of various organic substances in not one of the 35 variants was there a growth of algae in the dark. In the case of an acidic pH of the medium with the addition of glucose, acetic and pyruvic acids and ethyl alcohol, there was no increase in the yield of *D. salina* and *D. viridis* in the light or their growth in the darkness. Thus, in all the experiments, *D. salina* and *D. viridis* behave as strictly photoautotrophic algae. Author

N67-13841* Yale Univ., New Haven, Conn.

[DETERMINATION AND ANALYSIS OF THE PROPERTIES AND CHARACTERISTICS OF EXTREMELY SMALL FREE-LIVING SELF-REPLICATING CELLS] Status Report, 1 Feb.-1 Aug. 1966

1 Aug. 1966 29 p refs

(Grant NsG-208)

(NASA-CR-80765) CFSTI: HC \$2.00/MF \$0.50 CSCL 06C

Progress is reported from an extensive examination of the thermodynamic limitations underlying the living processes. The purpose of the study is to present evidence for the general thesis that the flow of energy through a system acts to organize that system. Based on energy flow research in simple model systems, it is demonstrated that the evolution of molecular order follows from known principles of physics and does not require the introduction of new laws. Consideration is given to certain aspects of biology in terms of the concepts of thermodynamics, statistical mechanics, and the kinetic theory which lead to a closer relation between biology and physics. A.G.O.

N67-13867# Douglas Aircraft Co., Inc., Santa Monica, Calif.

THE EFFECTS OF MINIMAL DEHYDRATION UPON HUMAN TOLERANCE TO POSITIVE ACCELERATION

E. H. Taliaferro, R. R. Wempen, and W. J. White Oct. 1964 15 p refs

(Douglas Paper-3114)

The responses of three groups of human subjects to positive acceleration after undergoing minimal dehydration and heat stress are presented. A decrease in acceleration tolerance of 15% to 18% is noted. It was determined that the effects of heat stress alone did not produce the observed decrease. The possible underlying mechanisms producing these effects are discussed, and recommendations are made for future studies. Author

N67-13876* # Battelle Memorial Inst., Columbus, Ohio.

THE CULTIVATION OF HYDROGEN-FIXING BACTERIA Quarterly Status Report, 1 Jul.-30 Sep. 1966

J. F. Foster 25 Oct. 1966 13 p

(Contract NASr-100(03))

(NASA-CR-80769; QSR-14) CFSTI: HC \$1.00/MF \$0.50 CSCL 06M

Tentative interpretations are presented of the experimental results from six runs in the continuous-culture apparatus, in which the organism, *Hydrogenomonas eutropha*, was grown under a controlled environment for periods of 3 to 5 days in each run. It is reported that the results show growth rates much higher than had been previously observed with this organism, and it is noted that the initial growth period is critical in determining the course of the active growth in denser cultures that are produced later. The change in mode of growth is identified by a sharp pH minimum, followed by a rapid rise. Presumably, this is caused by release of ammonia as an extracellular decomposition product from urea. A.G.O.

N67-13902# Illinois Univ., Urbana. Group Effectiveness Research Lab.

TOWARD AN ANALYSIS OF THE COMPONENTS OF INTERPERSONAL ATTITUDES

Harry C. Triandis Jul. 1966 51 p refs

(Contract Nonr-1834(36); ARPA Order 454)

(TR-35; AD-638177) CFSTI: HC \$3.00/MF \$0.50

The paper presents evidence that interpersonal attitudes are multidimensional. In addition to the distinctions between the affective, cognitive and behavioral component, it is shown that these components themselves are multidimensional. A number of studies dealing with the dimensionality of the behavioral component are reviewed. Operational procedures for the measurement of each of the components and sub-components are presented. The stability of such measurements across different samples of social stimuli obtained from samples of individuals from several cultures is reviewed. The relationships between the characteristics of individuals and responses to the various components and sub-components of attitudes are reviewed. Finally, a theory is presented which relates the individual's attitudes to his behavior. Author (TAB)

N67-13904 George Washington Univ., Washington, D. C. Human Resources Research Office.

A TENTATIVE ORGANIZATIONAL SCHEMA FOR DECISION-MAKING PROBLEMS

William C. Osborn and Barbara Ettinger Goodman Jul. 1966 26 p refs /ts Exploratory Study 12

(Contract DA-44-188-ARO-2)

(HUMRRO-TR-66-14; AD-638724) CFSTI: HC \$2.00/MF \$0.50

To take into account the psychological complexity of most real-life decision problems, and to develop a tentative organization of decision behavior that will embrace the many, highly diverse types of problems which are presumed to result in

decision, an attempt was made to delineate the component response processes that lead to these decisions. The procedure followed was (a) to identify and descriptively define the relevant stimulus and organismic factors, and (b) especially to schematize the response dimensions involved, in such a way as to derive a tentative response matrix. The result is an organizational schema for use in analyzing the response aspects of the decision-making process in terms of the pertinent psychological dimensions of decision behavior. Author (TAB)

N67-13906# Goteborg Univ. (Sweden).

THE INFLUENCE OF THROMBOCYTE AGGREGATION ON RENAL CIRCULATION. AN EXPERIMENTAL STUDY IN THE CAT

Lars O. Hansson 1965 23 p refs
(Contract AF 61(052)-732)
(AD-636694)

Changes in renal blood flow during local perfusion hypothermia with cooled autologous blood, and after experimentally induced thrombocyte aggregation during normothermia, have been analysed in the cat. Perfusion cooling of the kidney to 20°C caused a two- to threefold increase in renal vascular resistance in most cases. However, in one-fourth of the animals investigated perfusion cooling provoked an extreme increase in flow resistance, eventually causing a complete renal blood flow obstruction at temperatures below 30°C. Most of these animals showed signs of infections of various kinds. The cold-induced increase in vascular resistance, whether moderate or extreme, could not be ascribed to any renal vasoconstriction, since the renal vessels were found to relax on cooling below 30°-28°C and to be largely insensitive to constrictor influences at temperature around 20°C. Cooling of the blood induced a significant drop in thrombocyte counts and when a complete renal blood flow obstruction ensued, the small renal vessels were occluded by aggregated thrombocytes. This was especially easily demonstrated in the glomerular capillaries. In these cases flushing with warm cellfree perfusates readily rinsed the renal vascular bed free of the aggregates if performed within 15-20 minutes after the complete obstruction occurred; after that period the obstruction became irreversible. Author (TAB)

N67-13911# Pennsylvania Univ., Philadelphia.

CHARACTERIZATION AND CLASSIFICATION OF CHOICE EXPERIMENTS

Robert R. Bush, Eugene Galanter, and R. Duncan Luce [1960] 45 p refs
(Contract Nonr-551(37); Grants NSF G-8864; NSF G-17637; NSF G-14839)
(AD-638218) CFSTI: HC \$2.00/MF \$0.50

An outcome structure is used as a model for the classification of learning and psychophysical experiments, and summaries are presented of identification and non-identification experiments that can be categorized as nonasymptotic or asymptotic. It is the study of how preferences among outcomes are to be characterized, or so-called gambling experiments that are associated with theoretical studies of the notion of utility, that are difficult to classify. The tables presented indicate a pattern of omissions, and that there are no standard psychological experiments that can be classified as optional or ambiguous identification. This represents either a serious gap in experimentation or an area in which there is little interest. A complementary relation is shown between the non-empty cells in the asymptotic and nonasymptotic rows. It appears that standard designs in learning are non-existent in psychophysics, and vice versa. It is concluded that a single theory should predict both learning and asymptotic behavior, and that further investigation is required. M.W.R.

N67-13917*# Naval School of Aviation Medicine, Pensacola, Fla. Naval Aerospace Medical Inst.

A TORQUE MOTOR SERVOROTATOR FOR VESTIBULAR APPLICATION

W. Carroll Hixson and Jorma I. Niven Sep. 1966 18 p refs
(NASA Order R-93)
(NASA-CR-80763; NAMI-979) CFSTI: HC \$1.00/MF \$0.50
CSCL 06B

A novel servorotator, the Periodic Angular Rotator (PAR), has been developed for vestibular studies. A low speed, direct-coupled, DC torque motor is operated as a velocity or displacement mode power servomechanism to achieve a drive system with low acoustic noise and mechanical vibration properties, fast dynamic response characteristics, and a high degree of coupling stiffness. The device has a maximum angular velocity of 100 rpm, a maximum angular acceleration of 100 deg/sec² and can be programmed to produce sinusoidal angular acceleration stimuli extending to beyond 2.0 cps, an upper limit which is an order of magnitude greater than that previously available. Author

N67-13956# Leiden Univ. (Netherlands)

MOLECULAR AND RADIATION GENETICS Annual Report, 1965

1966 24 p refs
(EURATOM-052-64-1 BIAN)
(EUR-2983 e) CFSTI: HC \$1.00/MF \$0.50

Structural and functional effects of ionizing radiation upon various types of DNA under a variety of conditions are discussed, as well as promising and far reaching test systems. Extensive investigations are made of the mechanism of induction of mutations in *Drosophila* by ionizing radiation with an emphasis on processes involved in post-radiation repair. Extension of the work to cover mechanisms of enzyme action and their modification by irradiation and effects in cultured mammalian cells is under way. Author

N67-14035*# Oak Ridge National Lab., Tenn.

SYNERGISTIC EFFECT OF ZERO-G AND RADIATION ON WHITE BLOOD CELLS. AN EXPERIMENT FOR THE GEMINI III MANNED SPACE FLIGHT Annual Report, Period Ending 30 Jun. 1965

M. A. Bender Aug. 1966 43 p refs
(NASA Order R-104; Contract W-7405-ENG 26)
(NASA CR-80821; ORNL-TM-1550) CFSTI: HC \$2.00/MF \$0.50
CSCL 06R

The design and execution of an experiment on the synergistic effect of zero-G and radiation on white blood cells, which was successfully carried out during the Gemini III manned space flight of March 23, 1965, are described. The experiment consisted of the irradiation of samples of human leukocytes with ³²P beta particles during the orbital phase of the mission, and the subsequent cytogenetic analysis of the material to determine chromosomal aberration rates. Preparation of the experiment included the design, fabrication, and testing of the necessary hardware and equipment. The experimental data showed that although there was no significant difference between the yields of multiple-break chromosome aberrations induced on the ground and induced during orbital flight, the frequency of single-break aberrations was significantly higher in the flight samples. Several lines of evidence rule out the possibility that this difference arose from differences in absorbed dose, temperature, oxygen tension, or other parameters known to influence chromosome aberration yields. That the space flight itself induced aberrations is ruled out by the experiment control samples and also by preflight and postflight blood samples

obtained from the Gemini III flight crew. A synergism between radiation and some space-flight parameter thus appears to exist for human chromosome aberration production. NSA

N67-14042# Brookhaven National Lab., Upton, N. Y. Biology Dept.

INTERPRETATION OF MICROBEAM EXPERIMENTS FOR MANNED SPACE FLIGHT

Howard J. Curtis 1965 15 p refs Presented at the Workshop Conf. on Space Radiation Biol., Berkeley, Calif.

(Contract AT(30-2)-GEN-16)

(BNL-9468; CONF-650924-1) CFSTI: HC \$1.00/MF \$0.50

Previously reported work with a deuteron microbeam, which simulates the biological action of heavy particles, has shown 1) that the brain is very insensitive to this type of radiation, 2) that the epithelial cells of the lens of the eye are quite sensitive, but it takes more than a very few abnormal cells to form a cataract and 3) the hair follicles are quite sensitive, and a relatively small dose will cause the hair from an irradiated follicle to turn gray. These results are quite in accord with modern concepts in radiobiology which have been deduced from many different kinds of experiments. From these considerations one can estimate the effect of these particles on other organs of the body. It is then possible to predict with considerable confidence from the known fluxes that the heavy cosmic ray particles will not constitute an appreciable hazard for space flights of some months duration.

Author (NSA)

N67-14130# Union Carbide Nuclear Co., Oak Ridge, Tenn. Y-12 Plant

CHARACTERIZATION OF Y-12 URANIUM PROCESS MATERIALS CORRELATED WITH IN VIVO EXPERIENCE

L. M. Steckel and C. M. West 28 Jul. 1966 44 p refs

(Contract W-7405-ENG-26)

(Y-1544-A) CFSTI: HC \$3.00/MF \$0.50

Twenty-two process materials from the Y-12 enriched uranium area were selected as suspect exposure materials to five employees showing internal chest burdens with long biological half lives. As a means of establishing which of these were the most likely exposure materials, measures were made of their solubility in a simulated lung fluid; each was characterized as to particle size, uranium composition, and other contaminants. Similar analyses were made on oxides prepared at known temperatures to further study the insolubility parameters. The studies indicated that three process combustion ashes, containing uranium octoxide (U_3O_8), were the most likely exposure materials. These materials apparently differed from those used in previous animal studies in thermal history, particle size, and level of contamination. In view of these differences and the paucity of such animal data, it was recommended that animal experiments be conducted using these three ashes.

Author (NSA)

N67-14148# Joint Publications Research Service, Washington, D. C.

MEDICAL AND BIOLOGICAL PROBLEMS OF SPACEFLIGHTS. SPACE BIOLOGY AND MEDICINE

V. I. Yazdovskiy 2 Dec. 1966 630 p refs Transl. into ENGLISH of the book "Kosmicheskaya Biologiya i Meditsina. Mediko-Biologicheskiye Problemy Kosmicheskikh Poletov" Moscow, Nauka, Publishing House, 1966 462 p

(JPRS-38935; TT-66-35359) CFSTI: \$9.30

Various aspects of the problems involved in manned space flight are considered in relation to space biology and medicine. Extensive details are given on the following topics: the nature and structure of the universe, interplanetary trajectories, methods of space research, fundamental problems of space biology and medicine, developmental stages of space biology in the U.S.S.R., impact and nonimpact accelerations, weightlessness, cosmic radiation and its biological effects, methods of medical and biological investigations during space flights, life support systems based on physical and chemical methods and on biological recirculation of substances, safety assurance in space flights, space psychology, psychophysiological capacity of astronauts relative to the control of a space craft and its systems, and specialized training of astronauts. Complete bibliographies are included with each article. L.E.W.

N67-14155# Joint Publications Research Service, Washington, D. C.

CONTEMPORARY PROBLEMS OF BIONICS AND THEIR PHILOSOPHICAL SIGNIFICANCE

E. I. Levi 12 Dec. 1966 7 p Transl. into ENGLISH from *Filosofskiyi Nauki (Leningrad)*, no. 5, 1966 p 169-172

(JPRS-39056; TT-66-35479) CFSTI: \$1.00

A brief review is presented on several reports which were given at the Second All-Union Conference on Bionics; subject matter covered memory problems, mathematical models of human systems, automatic form recognition, engineering psychology, and methods for solving the problem of continuous media. Most reports were either specifically physiological or psychological. The overall successes in bionic investigations are assessed from the standpoint of the philosophical sciences. It is felt that problems will be solved on the basis of the primary positions of Marxist and Leninist philosophy, and that the conference demonstrated the worth of ideas of dialectic materialism.

M.G.J.

N67-14156# Joint Publications Research Service, Washington, D. C.

EFFECT OF ACTINOMYCIN 2703 ON THE STABILIZATION OF CONDITIONED REFLEXES AND THE TRANSITION FROM SHORT-TERM TO LONG-TERM MEMORY

F. Z. Meyerson, R. I. Kruglikov, and I. A. Goryacheva 12 Dec. 1966 6 p refs Transl. into ENGLISH from *Dokl. Akad. Nauk SSSR (Moscow)*, v. 170, no. 3, 1966 p 741-744

(JPRS-39060; TT-66-35483) CFSTI: \$1.00

In studying the role of nucleic acid synthesis in the formation of conditioned reflexes and in mechanisms of the conditioned reflex of elementary forms of memory, investigations were made of actinomycin 2703, an inhibitor of the DNA-dependent synthesis of RNA, on current-avoiding reactions in white male mice. After the buildup of the conditioned reflex of avoidance, one group of mice was subcutaneously administered 2.5 micrograms of actinomycin daily for 5 days, and the other group received similar injections of a water-alcohol solution. It was found that relatively long subcutaneous administration of actinomycin had no substantial effect on the preservation of previously induced conditioned reflexes; however, it was also shown that subcutaneous administration of the same actinomycin doses prior to the induction of the conditioned avoidance reflex profoundly disrupted the process of its formation. Finally, experiments are described in which it was demonstrated that a small dose of actinomycin disrupts the transformation of labile, short-term memory to resistant long-term memory. L.E.W.

N67-14173# Aktiebolaget Atomenergi, Stockholm (Sweden).

DECONTAMINATION EXPERIMENTS ON INTACT PIG SKIN CONTAMINATED WITH BETA-GAMMA-EMITTING NUCLIDES

K. A. Edvardsson, S. Hagsgard, and A. Swensson Nov. 1966 38 p refs

(AE-255) CFSTI: HC \$2.00/MF \$0.50

Experimental results from the comparison of decontamination methods are presented. In most of the experiments NaI-131 in water solution has been utilized because this nuclide is easy to detect and relatively harmless. Among the β - γ -nuclides studied I-131 has proved to be the one most difficult to remove from the skin. Conclusions and recommendations are given which are valid primarily for iodine in the form of NaI, but are probably applicable also to many other β - γ -nuclides. A.G.O.

N67-14175*# Maryland Univ., College Park. Dept. of Botany.

CARBON DIOXIDE AND CELL DIVISION

Constantine Sorokin Repr. from *Nature*, v. 206, no. 4979, 3 Apr. 1965 p 35-37 refs

(Grant NsG-70)

(NASA-CR-80817) CFSTI: HC \$1.00/MF \$0.50 CSDL 06C

Biological investigations are reviewed in which both the promoting and inhibitory effects of carbon dioxide on cell division were recorded. In discussing the discrepancies in these results it is pointed out that there must be a separation between the effects of carbon dioxide on cell growth and cell division A.G.O.

N67-14176*# Connecticut Univ., Storrs. Dept. of Botany.
FASCICULOCHLORIS, A NEW CHLOROSPHAERACEAN ALGA FROM A CONNECTICUT SOIL

Robert J. Mc Lean and Francis R. Trainor Repr. from Phycologia, v. 4, no. 3, 1965 p 145-148 refs
(Grants NsG(T)-47; NSF GB-1856)
(NASA-CR-80818) CFSTI: HC \$1.00/MF \$0.50 CSCL 06M

Fasciculochloris boldii gen. et sp. nov. is described from a Connecticut cornfield soil. It is placed in the Chlorosphaeraceae (Chlorosphaerales) and distinguished from *Chlorosarcinopsis* by its zoospores, which have a wall, a pyrenoid, and flagella of unequal length. Author

N67-14180# Naval Medical Research Inst., Bethesda, Md.
ELECTROCARDIOGRAPHIC CHANGES ON RABBITS UNDER THE EFFECT OF ELEVATED ATMOSPHERIC PRESSURE [IZMENENIJA ELEKTROKARDIOGRAMMY U KROLIKOV POD VLIANIEM POVYSHENNOGO ATMOSFERNOGO DAVLENIIA]

A. S. Solodkov 11 Jul. 1966 6 p Transl. into ENGLISH from Gigiena i Sanit. (Moscow), v. 30, no. 2, 1965 p 106-109
(NMS-TRANS-1125; TT-66-62155; AD-638189) CFSTI: HC \$1.00/MF \$0.50

Changes in the EKG of rabbits suggest a rather stable nature of metabolic disturbances in the heart, following the effect of compressed air on the animals. At the same time, observations indicate possible complete disappearance of disturbances in the myocardium provided there is a certain interval in the effect of elevated atmospheric pressure. Author (TAB)

N67-14210*# Minnesota Univ., Minneapolis.
"U" GEOLOGISTS DISCOVER EVIDENCE OF LIFE 3 BILLION YEARS AGO

Gerald Knox 23 Nov. 1966 2 p
(Grant NGR-24-005-054)

(NASA-CR-80833) CFSTI: HC \$1.00/MF \$0.50 CSCL 06C
A brief discussion is presented concerning a recent study conducted by a team of geologists from the University of Minnesota, the results of which offer further evidence supporting the theory that life has existed on earth for some three billion years. R.N.A.

N67-14219*# Yeshiva Univ., New York.
ADAPTATION TO VISUAL AND NONVISUAL REARRANGEMENT

Sidney Weinstein, Milton Richlin, Marvin Weisinger, and Larry Fisher Washington, NASA, Jan. 1967 33 p refs
(Grant NsG-489)
(NASA-CR-663) CFSTI: HC \$2.00/MF \$0.50 CSCL 05H

Experiments were performed to study the role of various types of informational feedback in producing visual adaptation to visual rearrangement and to various head, eye, and arm positions. The validity of the reafference theory, which states that self-induced movement is essential in producing visual adaptation to rearrangement, was tested. These studies showed that prismatic refraction can produce visual adaptation in the absence of active movement, that informational feedback is sufficient and most probably necessary, that reafference is not necessary, and that its sufficiency may reflect the degree of informational feedback it provides. It is also believed that prism wearing may provide visual adaptational effects through such nonvisual channels as differential input from

neck muscle receptors. The extrapolation of these results indicates the value of studying the role of intermodal effects on sensation and perception in all modalities. R.N.A.

N67-14245*# National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.
CARBON DIOXIDE CONTROL FOR MANNED SPACECRAFT

Rex B. Martin *In its* Selected Papers on Environ. and Attitude Control of Manned Spacecraft Dec. 1966 p 11-20 refs (See N67-14243 04-31) CFSTI: HC \$2.50/MF \$0.75

A systems design analysis is made for the control of carbon dioxide during manned missions of up to 180 days. Substitution of heat-assigned desorption for vacuum desorption permits a reduction in system expendables by using increased electrical power. A net system weight reduction results with increased mission duration, and the substitution of waste heat for electrical resistive heating achieves further system weight reduction. Crossover times are given for a nonregenerative system and three systems using a regenerative sorber molecular sieve. Potential weight savings are also indicated for a regenerative system using an amino acid salt sorber. Oxygen reclamation is assumed to be feasible for missions of 100 days or more, and the amino acid sorber is considered for this use. M.W.R.

N67-14246*# National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.
WATER AND WASTE MANAGEMENT SYSTEMS

Vernon G. Collins and Robert W. Johnson *In its* Selected Papers on Environ. and Attitude Control of Manned Spacecraft Dec. 1966 p 21-30 refs (See N67-14243 04-31) CFSTI: HC \$2.50/MF \$0.75

Various techniques for water reclamation from man's waste products are summarized, including air evaporation, distillation by waste heat, electrodialysis, membrane permeation, multfiltration, and vacuum compression distillation. Prototype hardware for some of the more promising techniques are being evaluated in order to develop better water and waste management systems. It is noted that significant launch-weight savings can be effected through the use of certain reclamation techniques, and weight and other advantages and disadvantages of each of the systems are discussed. M.W.R.

N67-14247*# National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.
CONTAMINANT COLLECTION AND IDENTIFICATION

Robert M. Bethea, Iris C. Anderson, and Robert A. Bruce *In its* Selected Papers on Environ. and Attitude Control of Manned Spacecraft Dec. 1966 p 31-41 refs (See N67-14243 04-31) CFSTI: HC \$2.50/MF \$0.75

The portion of the manned spacecraft contaminants problem involving contaminant collection and identification and biological effects is discussed. A specialized laboratory chromatograph for the detection and identification of permanent and low-molecular-weight gases present as trace contaminants in manned spacecraft and spacecraft simulators is described. This apparatus includes a special sampling device for use with manned simulators such as the integrated life support system test bed. The development of an inhouse integrated analytical system using combined gas chromatography, infrared spectrophotometry, and mass spectrometry techniques for contaminant identification is described. A tissue culture system for rapid screening of effects of toxic contaminants on biological systems is discussed, and some details of the operating procedures are given. Techniques of contaminant control by proper selection of materials and removal devices are presented. Author

N67-14248*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

CONTAMINANTS FROM MANNED SPACECRAFT SIMULATIONS

E. Eugene Mason and Charles H. Wilson *In its* Selected Papers on Environ. and Attitude Control of Manned Spacecraft Dec. 1966 p 43-52 ref (See N67-14243 04-31) CFSTI: HC \$2.50/MF \$0.75

Space conditions were simulated to study trace contaminants involved in nutritional and personal hygiene problems, and to test a completely enclosed life support system involving 5 men for 30 days. Except for ethyl mercaptan, the usual contaminants were identified during the first investigation; and charcoal sampling is shown to be a capable detector. First testing of the closed system aborted because of nausea and waste system malfunction, stressed the need for careful material selection, improved analytical techniques, and thorough trace contaminant appraisal. It is noted that a catalytic oxidizer designed to purify the air could, instead, produce byproducts more toxic than those originally present. A marked change in the normal bacterial floras in the noses and throats of the test subjects is reported during a second successful test, and the continuing need for more sensitive and reliable real time analytical equipment is indicated in both tests. M.W.R.

N67-14249*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

INTEGRATED REGENERATIVE LIFE SUPPORT SYSTEM FOR EXTENDED MISSION DURATIONS

Warren D. Hypes, Robert A. Bruce, and Franklin W. Booth *In its* Selected Papers on Environ. and Attitude Control of Manned Spacecraft Dec. 1966 p 53-65 (See N67-14243 04-31) CFSTI: HC \$2.50/MF \$0.75

Objective of the Integrated Life Support System (ILSS) project was to select, design, and develop a working model of a regenerative life support system capable of supporting a 4-man crew in a zero-gravity environment for a period of 1 year. Resupply at 60 to 90 day intervals was assumed. A tradeoff of all techniques of life support was made at component, subsystem, and system levels. The selected system utilizes a waste heat loop to supply process heat. An oxygen recovery loop based on regenerative carbon dioxide adsorption, hydrogen reduction of carbon dioxide, and electrolysis of water was selected. Closed-loop air evaporation was chosen to recover useful water from waste water. Vacuum-thermal dehydration with subsequent storage at cabin temperature was selected for processing solid waste products. While the development effort appears to be feasible, final assessment awaits a detailed evaluation. Author

N67-14251*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

WATER-IMMERSION TECHNIQUE FOR SIMULATION OF INGRESS-EGRESS MANEUVERS UNDER CONDITIONS OF WEIGHTLESSNESS

Otto F. Trout, Jr. *In its* Selected Papers on Environ. and Attitude Control of Manned Spacecraft Dec. 1966 p 79-87 (See N67-14243 04-31) CFSTI: HC \$2.50/MF \$0.75

A water-immersion technique has been developed whereby a pressure-suited subject, unrestrained by connecting lines and hoses, can simulate maneuvers under conditions of weightlessness in six degrees of freedom. This simulation has been applied to a series of ingress-egress experiments; and the results of these experiments indicate that the technique has application to the study of human factors and capabilities in extravehicular space operations and to a determination of design criteria for advanced manned space vehicles and related equipment. Author

N67-14314# Federal Aviation Agency, Oklahoma City, Okla.
THE PREDOMINANT CAUSES OF CRASHES AND RECOMMENDED THERAPY

Stanley R. Mohler Apr. 1966 3 p refs (AM-66-8)

Close scrutiny of the causes of recent general-aviation fatal crashes reveals that there is a wide discrepancy between the accident rate and the actual risk of flying. A large percentage of accidents occur through horseplay, foolishness, and lack of respect for nature. An increased awareness of the state of one's body while flying, enhanced training, and attitude inculcation can do much to lower the accident rate. Pilots should be instructed to avoid flight while suffering from emotional distress or the effects of alcohol consumption or during deteriorating weather conditions. Author

N67-14317 Library of Congress, Washington, D. C. Aerospace Technology Div.

PHYSIOLOGICAL EXPERIMENTS WITH ANIMALS AND BIOLOGICAL STUDIES DURING GEOPHYSICAL AND ORBITAL FLIGHTS *Surveys of Foreign Scientific and Technical Literature*

Sally Warren 16 Sep. 1966 17 p (ATD-66-117)

A synopsis of Soviet physiological experiments and biological studies with animals during geophysical and orbital flights is presented. Cited are experimental investigations on the physiological reactions of animals to accelerations, vibrations, noise, abnormal pressures, and sharp fluctuations of ambient temperature; and rocket experiments on the effect of weightlessness and the role of orientation reactions in space-flight respiration, heart-action, and blood pressure irregularities. Technological advances resulting from these studies such as the development of bioinstrumentation and radio-electronic equipment for recording simulated and actual flight data on the basic physiological functions of the animal and spaceship atmospheric parameters are discussed. The significance of experiments with the dog Laika aboard Sputnik II and succeeding experiments with dogs, rats, mice, fruit flies, and green plants is also discussed. Included are photographs which are presented in support of the text. S.C.W.

N67-14339# Joint Publications Research Service, Washington, D. C.

PROBLEMS OF RADIATION SICKNESS PROPHYLAXIS AND TREATMENT

C. Zamfir, H. Herscovici, Gh. Cioba, and C. Andronie 4 Jan. 1967 15 p refs Transl. into ENGLISH from Rev. Sanit. Milit. (Bucharest), no. 6, Nov.-Dec. 1966 p 939-948 (JPRS-39391; TT-67-30042)

A discussion is given of the problems associated with protection against and treatment of radiation sickness. Treatment schedules are shown, and present methods of fighting infection, treatment with bone marrow, neuropsychic treatment, and treatment of the digestive syndrome. Some aspects associated with elimination of radioactive nuclides from the body are included. C.T.C.

IAA ENTRIES

A67-12850

SENSORY INFORMATION NECESSARY FOR THE SIZE-WEIGHT ILLUSION.

Helen E. Ross (Hull, University, Dept. of Psychology, Hull, Yorks England).

Nature, vol. 212, Nov. 5, 1966, p. 650. 13 refs.

Investigation of the differences in muscular effort which accompany errors of weight judgment. It appears that the illusion is not dependent on any one type of sensory information but is due to central rather than peripheral processes. F. R. L.

A67-12913 =

EXPERIMENTAL INVESTIGATION OF PILOT DYNAMICS IN A PILOT-INDUCED OSCILLATION SITUATION.

D. L. Hirsch (Northrop Corp., Hawthorne, Calif.) and R. L. McCormick (Northrop Corp., Northrop Norair, Hawthorne, Calif.). (American Institute of Aeronautics and Astronautics, Royal Aeronautical Society, and Japan Society of Aeronautical and Space Sciences, Aircraft Design and Technology Meeting, Los Angeles, Calif., Nov. 15-18, 1965, Paper 65-793.)

Journal of Aircraft, vol. 3, Nov.-Dec. 1966, p. 567-573. 5 refs.

A67-13084 #

SIMULATING THE PURPOSEFUL BEHAVIOR OF LIVING ORGANISMS [MODELIUVANNIA TSILESPRIAMOVANOI PAVEDINKI ZHIVIKH ORGANIZMIV].

A. M. Kasatkin and L. M. Kasatkina. Avtomatika, vol. 11, no. 5, 1966, p. 51-56. 5 refs. In Ukrainian.

Description of an informal automaton which simulates certain processes of information processing by the human brain. This automaton is used to simulate human motor behavior in a medium containing positive and negative stimuli of various intensities, the work of the automaton being to reach decisions and carry them out. The actions of the automaton in a conditional medium are directed toward a definite object, which may be given by an experimenter or formulated by the automaton itself. To achieve the object, a plan of motion in the medium is made by the automaton. The execution of the plan is controlled by special servosystems. If the results obtained at any stage of realization of the plan do not coincide with the expected results, the plan is corrected or revised completely. The possibility of self-training is provided in certain areas of information processing. A. B. K.

A67-13299

CAPACITY AND OPTIMUM CONFIGURATION OF DISPLAYS FOR GROUP VIEWING.

Helmut Weiss (Philco Corp., Aeronutronic Div., Guidance and Technology Dept., Newport Beach, Calif.).

Information Display, vol. 3, Nov.-Dec. 1966, p. 24-27, 29, 30.

Discussion of the deterioration of legibility with increasing viewing distance and obliquity which limits the amount of information a display screen can convey to an immobile audience. The resulting display capacity and the degree of its use determine the efficiency of the display, where efficiency relates audience area to screen size for the most favorable screen/audience configuration. The underlying geometric relationships, derived from legibility experiments, are presented in quantitative form and illustrated by examples. Their application enables a designer to determine optimum display configurations on the basis of geometry rather than intuition. M. M.

A67-13300

DISPLAY REQUIREMENTS ASSESSMENT FOR COMMAND AND CONTROL SYSTEMS.

Rudy Kuehn (Douglas Aircraft Co., Missile and Space Systems Div., Information Sciences Subdiv., Santa Monica, Calif.). (NATO, AGARD, Symposium, 11th, Munich, West Germany, Nov. 7-10, Paper.)

Information Display, vol. 3, Nov.-Dec. 1966, p. 43-46.

The major underlying parameters of a command and control display depend to a great extent upon the basic attributes of the human visual mechanism. The latter are briefly reviewed in order to place the display system requirements in harmony with visual limitations. Resolution, amount of data displayed, display dynamics, coding, and screen size are discussed. Illustrations are given by means of figures and tables of the interrelationship of certain of these criteria. Material is presented demonstrating that display specification and design need not be based upon intuitive judgment, but do have a foundation in sound scientific and engineering principles. The proper parametric designation of the command and control display system can lead to greater effectiveness and overall satisfactory performance. (Author)

A67-13539 #

SOME PROBLEMS OF RADIATION PROTECTION DURING SPACE FLIGHTS. I [ÜBER EINIGE PROBLEME DES STRAHLENSCHUTZES BEI KOSMISCHEN FLUGEN. I].

H. Swart.

Astronomie und Raumfahrt, no. 4, 1966, p. 119-123. 6 refs. In German.

Attempt to assess the radiation hazard that arises for astronauts from ionizing radiation, particularly from solar and galactic cosmic rays and the radiation belts, and to calculate the protective shielding required against such radiation. The problem is seen to be greatly complicated by the strong seasonal variations in the intensity, composition, and energy spectrum of these types of radiation and by the still insufficient data on their biological effects. The secondary radiation induced in the vehicle walls and bodies of the astronauts by the primary cosmic rays is taken into account. V. P.

A67-13594 *

ALKANES IN FUNGAL SPORES.

J. Oro, J. L. Laseter, and D. Weber (Houston, University, Dept. of Chemistry and Dept. of Biology, Houston, Tex.). Science, vol. 154, Oct. 21, 1966, p. 399, 400. 13 refs. U. S. Department of Agriculture Grant No. 12-14-177-8062; Grant No. NSG-257-62.

The chlamydo-spores of *Ustilago maydis*, *U. nuda*, and *Sphacelotheca reiliana* were analyzed by gas chromatography and mass spectrometry for their hydrocarbon contents. For the first time we observed that they contain paraffinic hydrocarbons; the average contents were 42, 58, and 146 ppm, respectively. n-Alkanes having odd numbers of carbon atoms predominate, with carbon-chain lengths ranging from C₁₄ to C₃₇. The major alkanes are n-C₂₇ in *U. maydis*, n-C₂₇ and n-C₃₅ in *U. nuda*, and n-C₂₉ in *S. reiliana*. Each type of spore carried a distinctly characteristic population of hydrocarbons. (Author)

A67-13924

COMPARATIVE INVESTIGATION OF THE PHYSICAL FITNESS OF MAN WITH RESPECT TO MANUAL LABOR, OXYGEN DEFICIENCY, AND ACCELERATION [VERGLEICHENDE UNTERSUCHUNGEN DER KÖRPERLICHEN LEISTUNGSFÄHIGKEIT DES MENSCHEN BEI MUSKELARBEIT, IM SAUERSTOFFMANGEL UND BEI BESCHLEUNIGUNG].

K. E. Klein, H. Brüner, J. Eichhorn, Kl. Schalkhäuser, J. Schotte, E. D. Voigt, and H. M. Wegmann (Deutsche Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Bad Godesberg, West Germany).

(International Congress of Physiological Sciences, 13th, Symposia on Environmental Physiology, Kyoto, Japan, Sept. 13-17, 1965, Paper.)

Internationale Zeitschrift für angewandte Physiologie einschliesslich Arbeitsphysiologie, vol. 22, 1966, p. 190-206. 49 refs. In German.

Analysis showing that if physical fitness is defined as the capability to perform work aerobically over a period of several minutes with maximum effort, then the parameter that provides direct information on physical fitness is the degree of oxygen consumption during maximum effort. An evaluation of a number of existing methods for

A67-13927

investigating physical fitness as to their correlation with the oxygen-consumption parameter shows that only the method based on the determination of $\dot{V}O_2 \text{ max}$ from the pulse level during submaximum physical labor with the aid of Astrand's normogram gives a true reflection of aerobic fitness.

V. P.

A67-13927

WEIGHTLESSNESS AND FRENCH EXPERIMENTS IN SPACE BIOLOGY [LA NON PESANTEUR ET LES EXPERIENCES BIOLOGIQUES SPATIALES FRANCAISES].

Chatelier and Gibert (Centre d'Enseignement et de Recherches de Médecine Aéronautique, Paris, France).

Revue Française d'Astronautique, Sept.-Oct. 1966, p. 132-137. In French.

Results of experiments carried out to determine the effect of weightlessness on the level of vigilance of animals (cats and rats) launched in rockets. An analysis is made of the electrical activity of the cerebral cortex, as indicated by electrocorticograms, as a basis for determining the level of vigilance during a period of weightlessness. The results of studies of the cardiac and respiratory rates of the subjects are also cited.

A. B. K.

A67-13928

EQUIPMENT IN THE NOSE CONES OF ROCKETS IN C. E. R. M. A. BIOLOGICAL EXPERIMENTS [L'EQUIPEMENT DES POINTES DE FUSEES DESTINEES AUX EXPERIENCES BIOLOGIQUES DU C. E. R. M. A.].

M. Giot and C. de Lisle (Sud-Aviation, Paris, France).

Revue Française d'Astronautique, Sept.-Oct. 1966, p. 138-141. In French.

Description of the equipment used by the Centre d'Enseignement et de Recherche de la Médecine Aérospatiale (C. E. R. M. A.) in the nose cones of rockets containing animals (cats and rats) in a state of weightlessness. The layout of the nose cones is described in detail, as well as the telemetering and programing equipment carried on board. Two recovery sequences used in braking the nose cones during their reentry into the earth's atmosphere and in parachuting them safely to the ground are outlined.

A. B. K.

A67-14023 #

COMMUNICATION OF AEROSPACE TECHNOLOGY TO BIOLOGY AND MEDICINE.

Quentin L. Hartwig (George Washington University, Washington, D. C.).

American Institute of Aeronautics and Astronautics, Annual Meeting, 3rd, Boston, Mass., Nov. 29-Dec. 2, 1966, Paper 66-952, 5 p. Members, \$0.75; nonmembers, \$1.50.

Description of a NASA program designed to present pertinent information and technology derived from the space program to non-aerospace biomedical workers. It has been found that the most effective way to initiate cross-disciplinary transfer is to work as closely as possible with biomedical researchers. To do this, the NASA Technology Utilization Division sponsors three teams working on biomedical applications whose function it is to gather from participating researchers information on problems which may be impeding their experimental progress. The teams then turn to the engineers and scientists of the space program to find solutions to these problems. Some examples of transfers are given.

F. R. L.

A67-14137 * #

INTERNAL ENERGY SOURCES FOR IMPLANTED DEVICES.

J. J. Konikoff (General Electric Co., Missile and Space Div., Re-Entry Systems Dept., Valley Forge, Pa.).

American Institute of Aeronautics and Astronautics, Annual Meeting, 3rd, Boston, Mass., Nov. 29-Dec. 2, 1966, Paper 66-930, 7 p. 13 refs.

Members, \$0.75; nonmembers, \$1.50.

Contract No. NAS 2-1420.

Discussion of several approaches to utilize the body as the source of power for implanted electronic devices. These include bioelectric and myoelectric potentials, motion conversion to electricity, and implanted fuel cells. These approaches result in outputs approaching 1000 μw at 1/2 v. The utilization of skeletal muscle power is also discussed.

M. F.

A67-14287 #

PHYSIOLOGICAL EFFECTS OF AN 18-HOUR FLIGHT IN F-4C AIRCRAFT.

Edward F. Kramer, Jr., Henry B. Hale, and Edgar W. Williams (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Brooks AFB, Tex.).

Aerospace Medicine, vol. 37, Nov. 1966, p. 1095-1098. 15 refs.

Discussion of the physiological assessment by means of postflight urinalysis of eight pilots who flew F-4C aircraft for 18 hr. Flight effects were neither numerous nor of large magnitude, nor were the pilots unduly fatigued. The flight-induced physiological changes included (1) increased 17-hydroxycorticosteroid excretion (which implies adrenocortical stimulation) and (2) decreased excretion of uric acid, potassium, and urine (which suggests metabolic depression).

B. B.

A67-14288

VESTIBULAR RESPONSES FROM FIGURE SKATERS.

William E. Collins (Federal Aviation Agency, Office of Aviation Medicine, Civil Aeromedical Institute, Oklahoma City, Okla.).

Aerospace Medicine, vol. 37, Nov. 1966, p. 1098-1104. 5 refs.

Description of a series of laboratory tests consisting primarily of caloric irrigations and mild angular accelerations of the semi-circular ear canals of several professional figure skaters. Brisk nystagmus and clear turning sensations were consistent findings in total darkness. Vigorous nystagmus and dizziness or turning sensations occurred following spins when visual fixation was not permitted. Implications of the data for medical evaluations and for problems in aerospace medicine are noted.

B. B.

A67-14289 *

WASTE MANAGEMENT AND PERSONAL HYGIENE UNDER CONTROLLED ENVIRONMENTAL CONDITIONS.

Arnold R. Stonim (USAF, Systems Command, Aerospace Medical Div., Aerospace Medical Research Laboratories, Life Support Div., Wright-Patterson AFB, Ohio).

(Aerospace Medical Association, Annual Meeting, 37th, Apr. 19, 1966, Paper.)

Aerospace Medicine, vol. 37, Nov. 1966, p. 1105-1114. 13 refs.

NASA Contract No. R-85, Contracts No. AF 33(657)-11716, No. AF 33(615)-1814.

Evaluation of the effects of various experimental conditions on the nature of human waste to determine waste management criteria for space systems. Thirty-six highly selected young male subjects were used in a series of nine six-week experiments. No significant changes resulted from a dehydrated food diet, evaluator comment, wearing of full pressure suits, and constant 32°C exposure. The effects of minimal personal hygiene in these subjects are also evaluated.

B. B.

A67-14290

VASODEPRESSOR EFFECT OF REOXYGENATION.

R. G. Burford and C. W. Gowaty (Western Ontario, University, Dept. of Pharmacology, London, Ontario, Canada).

Aerospace Medicine, vol. 37, Nov. 1966, p. 1114-1120. 18 refs.

Research supported by the Defence Research Board of Canada.

Study of the cardiovascular changes occurring during the sudden reoxygenation of cats. After a critical degree of hypoxia in anesthetized cats, reoxygenation evoked a transient vasodepressor effect which occurred sooner and was more severe with oxygen than with room air. There was some bradycardia, slower respiration, and rise in central venous pressure, but no decrease in cardiac output. It is suggested that at least part of the vasodepressor response was caused by a transiently acting vasodilator substance.

B. B.

A67-14291 #

HANGOVER EFFECT OF SECOBARBITAL ON SIMULATED PILOTAGE PERFORMANCE.

Bryce O. Hartman (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Psychobiology Section, Brooks AFB, Ohio) and Richard E. McKenzie (Federal Aviation Agency, National Aviation Facilities Experimental Center, Atlantic City, N. J.).

Aerospace Medicine, vol. 37, Nov. 1966, p. 1121-1124.

Supplementary study to previous work on performance decrement in a simulated piloting task as a residual effect of secobarbital.

This is a followup study to evaluate both the dose levels and the "hangover" effect without the complications of an extended "mission" and another drug (d-amphetamine) used in the previous design. The results on 64 subjects performing a simulated flying task for 4 hr under one of four treatment conditions (3.0 gr of secobarbital, 1.5 gr of secobarbital, placebo, or control), indicated that 3.0 gr of secobarbital administered the previous evening 10 hr prior to the "flight" produced degraded performance with associated subjective reports of a "hangover" effect. No degradation of performance was obtained with a dose level of 1.5 gr. (Author)

A67-14292

CHANGES OF ELASTIC PROPERTIES OF LUNGS OF RABBITS IN AIR BLAST INJURY.

Carl-Johan Clemedson, L. Elstorp, H. Pettersson, and A. B. Sundqvist (Research Institute of National Defence, Biophysics Section, Sundbyberg, Sweden).

Aerospace Medicine, vol. 37, Nov. 1966, p. 1125-1130. 19 refs.

Anesthetized rabbits were exposed to high explosive air shock waves in a shock tube. The peak reflection overpressures varied from 2.1 to 3.3 bar and the duration of the positive pressure phase from 9.4 to 14.8 msec. The increase in weight, due to hemorrhages, of the most severely injured lung was in the group of animals with slight to moderate lung injuries up to 50% (quotients of lung hemorrhage 0.7 to 1.5), and in the group of severely injured animals 60 to 180% (quotients of lung hemorrhage 1.6 to 2.8). Lung elasticity and compliance were determined through simultaneous recording of changes in tidal air volume and in the intrapleural pressure as reflected by the intraoesophageal pressure. In severely lung injured animals there is an instantaneous great increase in elastance and decrease in compliance of the lung. These changes remained during the whole observation period of 4 hr. Similar but much less pronounced changes occur in animals with slight to moderate lung injuries only. (Author)

A67-14293 *

A MODEL FOR THE SOCIAL SYSTEM FOR THE MULTIMAN EXTENDED DURATION SPACE SHIP.

S. B. Sells (Texas Christian University, Institute of Behavioral Research, Fort Worth, Tex.).

(AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS, AND AMERICAN ASTRONAUTICAL SOCIETY, STEPPING STONES TO MARS MEETING, BALTIMORE, MD., MARCH 28-30, 1966, TECHNICAL PAPERS, p. 433-440.)

Aerospace Medicine, vol. 37, Nov. 1966, p. 1130-1135. 8 refs. Grant No. NGR-44-009-008.

A67-14294

PHYSIOLOGICAL IMPLICATIONS AS TO SURVIVAL DURING IMMERSION IN WATER AT 75°F.

E. L. Beckman and E. Reeves (National Naval Medical Center, Naval Medical Research Institute, Bethesda, Md.).

Aerospace Medicine, vol. 37, Nov. 1966, p. 1136-1142. 12 refs.

This investigation was designed to study the physiological responses of subjects immersed to neck level in 75°F water for periods up to 12 hr. Measurements relating to the body loss of heat, energy, fluids, and electrolytes were obtained. It was found that a 12-hr period of immersion could not be tolerated by all of the subjects for various reasons: (1) loss of body heat with a reduction in deep body temperature to below the predetermined limiting temperature of 95°F; (2) extreme discomfort with muscle cramps following prolonged shivering; and (3) decrease in blood glucose to levels below the predetermined limiting value of 60 mg percent. The changes in blood morphology, blood electrolytes, oxygen utilization and urinary excretion during the period of immersion, in addition to the physiological changes which caused the termination of some experiments are directly related to tolerance of immersion. It was also found that some subjects experienced a significant adrenocortical stress response with subsequent adrenocortical insufficiency. These factors are of importance in survival from the involuntary immersion associated with disasters at sea. (Author)

A67-14295 #

PHYSIOLOGICAL BASIS FOR A PASSIVE EXTRAVEHICULAR THERMAL CONTROL SYSTEM.

G. D. Callin and W. C. Kaufman (USAF, Systems Command, Aerospace Medical Div., Aerospace Medical Research Laboratories, Biomedical Laboratory, Wright-Patterson AFB, Ohio).

Aerospace Medicine, vol. 37, Nov. 1966, p. 1143-1147. 7 refs.

Determinations of oxygen consumption during work simulating that to be expected in earth-orbital extravehicular activity indicate that 225-350 kcal/hr is a reasonable requirement for metabolic heat removal. A passive heat transfer system was postulated for an extravehicular suit and found capable of dissipating heat production at these levels for missions of 3 hr or less. (Author)

A67-14296 #

SOME CARDIOVASCULAR RESPONSES IN ANESTHETIZED DOGS DURING REPEATED DECOMPRESSIONS TO A NEAR-VACUUM.

Julian P. Cooke and Richard W. Bancroft (USAF, Systems Command, Aerospace Medical Div., School of Aerospace Medicine, Physiology Branch, Brooks AFB, Tex.).

Aerospace Medicine, vol. 37, Nov. 1966, p. 1148-1152. 13 refs. USAF-sponsored research.

Study of the effects of rapid decompression on the cardiovascular systems of anesthetized dogs. Repeated, rapid decompressions of the dogs from ambient pressures of 250 or 200 mm Hg abs within 1 sec to approximately 1 mm Hg, followed by exposures of from 55 to 240 sec before recompression, performed within a 4-hr period, have shown that the hearts of dogs will tolerate such exposures. A progressively severe degree of bradycardia was found to be proportional to the length of each anoxic exposure. A temporary high arterial and pulse pressure resulted in most animals following recompression, with a gradual return to normal values within 5 to 10 min. B. B.

A67-14297

EFFECTS OF ALTITUDE ON EMPHYSEMATOUS BLEBS AND BULLAE.

Joseph F. Tomashefski, Donald R. Feeley, and Frederick H. Shillit (Ohio State University, College of Medicine, Dept. of Preventive Medicine, Aviation Medical Research Laboratory, Columbus, Ohio).

Aerospace Medicine, vol. 37, Nov. 1966, p. 1158-1162. 18 refs. U.S. Public Health Service Grant No. EF 00036-04.

Investigation of the behavior of emphysematous blebs and bullae when ambient barometric pressure is lowered in a high-altitude simulator. Patients with diffuse obstructive pulmonary disease showing blebs and bullae were taken to simulated altitudes of 8000 and 18,000 ft at an ascent rate of 1000 ft/min. X-ray films made at ground level and the simulated altitudes of 8000 and 18,000 ft showed that the air spaces did not enlarge. The films were found to be identical in all other respects. It is concluded that such lesions may have ready communication with bronchi and surrounding lung parenchyma. B. B.

A67-14298

ACUTE ALTITUDE SICKNESS IN FEMALES.

Charles W. Harris, J. L. Shields, and John P. Hannon (U.S. Army, Medical Research and Nutrition Laboratory, Physiology Div., Denver, Colo.).

Aerospace Medicine, vol. 37, Nov. 1966, p. 1163-1167. 27 refs.

Evaluation of symptomatic responses of eight college females to high-altitude exposure at Pikes Peak, Colo. (altitude 14,110 feet). Significant illness occurred during the first four days at altitude, with the predominant complaints being headache, drowsiness, fatigue, and insomnia. Only minimal gastrointestinal and cardio-respiratory symptoms were noted. A reduction in blood pressure and elevation of resting pulse and respiratory rate was observed. The electrical activity and X-ray appearance of the heart remained within normal limits during the 10-week stay. Menstrual changes at altitude consisted of decreased flow in five girls. The response of several medications given for the symptoms of altitude sickness was evaluated. (Author)

A67-14330 #

CONTRIBUTION OF THE VESTIBULAR SECTION OF THE LABYRINTH TO POSTROTATIONAL CHANGES IN THE LEVEL OF ADRENALIN AND NORADRENALIN CONTENT IN SOME TISSUES OF WHITE RATS [ROL' VESTIBULIARNOI CHASTI LABIRINTOV V POSTVRASHCHATEL'NYKH IZMENENIYAKH UROVNIYA SODERZHANIYA ADRENALINA I NORADRENALINA V NEKOTORYKH TKANIYAKH BELYKH KRYS].

A. A. Pushkarchuk (Akademiia Nauk Belorusskoi SSR, Institut Fiziologii, Minsk, Belorussian SSR).
Akademiia Nauk BSSR, Doklady, vol. 10, Oct. 1966, p. 803-807. 21 refs. In Russian.

Determination of the adrenalin and noradrenalin content in the cerebrum, brain stem, myocardium, skeletal muscle, and adrenal gland of white rats with intact and destroyed labyrinths, subjected to centrifugation at 0.16 and 0.6 g for 1 min. Statistical treatment of the results shows an irregularly pronounced increase in adrenalin and noradrenalin content in all these tissues of rats with intact labyrinths. The results for rats with destroyed labyrinths were statistically inconclusive. V. Z.

A67-14389

HUMAN STRESS IN SPACE.

Robert Dean (Boeing Co., Multiple Stress Research Group, Seattle, Wash.).

Science Journal, vol. 2, Dec. 1966, p. 70-75.

Discussion of recent research which indicates that environmental stresses in space are not necessarily harmful, but in fact may have a beneficial effect by making astronauts more alert and by counteracting those stresses which are detrimental. Tests simulating boost and reentry stresses are investigated, and the effects of combining such stresses as heat, noise, vibration, and acceleration are studied. Finally, the pain-relieving effects of white noise are considered. B. B.

A67-14407 *

ORIENTATION OF WHEAT SEEDLING ORGANS IN RELATION TO GRAVITY.

Charles J. Lyon and Katsuyuki Yokoyama (Dartmouth College, Dept. of Biological Sciences, Hanover, N.H.; NASA, Ames Research Center, Moffett Field, Calif.).

Plant Physiology, vol. 41, June 1966, p. 1065-1073. 16 refs. Grant No. NsG-231; Contract No. NAS 2-1558.

Experimental investigation in which seedlings of wheat were grown in special holders that permitted the coleoptile and early roots to develop in moist air. The orientation of the organs of seedlings erect to gravity was compared with that of organs produced on a horizontal clinostat. Orientation was described by the angular position of each organ tip with reference to the axis of the embryo. The symmetry of the root system in wheat was found to depend on a specific mechanism. Under the influence of gravity, the earliest lateral roots were oriented in a plane at characteristic angles of about 57.5° with the ideal primary root. The corresponding angles for lateral roots growing on clinostats were greater by about 47.5° as a result of epinasty not previously reported in roots. This force also appeared to be active in the seminal roots of barley and rye but not of oats. M. M.

A67-14408 *

INCORPORATION OF PROTEIN AND NUCLEIC ACID PRECURSORS INTO FROG NERVOUS TISSUE IN VITRO.

Jacob Shapira, Peter C. F. Castellani, and Johnnie O. Coleman (NASA, Ames Research Center, Moffett Field, Calif.).

Society for Experimental Biology and Medicine, Proceedings, vol. 122, 1966, p. 637-640. 16 refs.

Observation of the effects of 1,1,3-tricyano-2-aminopropene (TCAP) on the incorporation of C¹⁴-adenine, C¹⁴-guanine, H³-uridine, H³-cytidine, and C¹⁴-valine into frog central and peripheral nervous tissue maintained in vitro. TCAP inhibited C¹⁴-valine incorporation into the protein fraction of both tissues. However, H³-uridine incorporation into RNA was inhibited only in brain tissue. TCAP caused changes in the nucleic acid metabolism of frog ganglia in general quite similar to those produced by DNP and azide. However, TCAP did inhibit adenine incorporation into RNA whereas DNP and azide did not. F. R. L.

A67-14425

BIOCONTAMINATION CONTROL.

Harold G. Lorsch (General Electric Co., Missile and Space Div., Valley Forge, Pa.).

Space/Aeronautics, vol. 46, Nov. 1966, p. 82-91.

Discussion of problems in hardware design and production, in launch, and at separation, encountered in developing ways to reduce the probability of biocontamination of a spacecraft and its equipment to a very low level to keep a Martian lander from depositing earth bacteria. The effect of contamination control procedures in the assembly stages of manufacture was assessed. The test results demonstrated the effects of seven different assembly procedures on the 282-lb entry capsule of the NASA-Ames Biosatellite, whose surface geometry is typical of a small Mars lander. The first assembly sequence represents conventional aerospace manufacturing techniques and results in the highest population count. The second and third sequence compare bioclean and conventional handling techniques in a standard cleanroom. The last four assembly procedures occur in laminar downflow rooms but only the fourth and seventh employ bioclean entry procedures. It is quite obvious that thermal or chemical decontamination of system assemblies will halve the organism count resulting from bioclean entry procedures. M. M.

A67-14489 *

GLYCOGEN ACCUMULATION IN MONKEY AND CAT BRAIN EXPOSED TO PROTON RADIATION.

J. Miquel and W. Haymaker (NASA, Ames Research Center, Moffett Field, Calif.).

(INTERNATIONAL CONGRESS OF NEUROPATHOLOGY, 5TH, ZURICH, SWITZERLAND, SEPTEMBER 1965, PROCEEDINGS.)

Excerpta Medica International Congress Series, no. 100, 1966, p. 792-797. 6 refs.

Investigation of the effects of ionizing radiation on brain glycogen metabolism of monkeys and cats. Proton irradiation of the animals' cerebrum and cerebellum resulted in glycogen accumulation apparently exclusively by astroglial cells. Maximal increase was observed at 24 to 48 hr after irradiation. These observations provide further support of the view that astrocytes have an essential function in carbohydrate metabolism of the brain. S. Z.

A67-14520 *

STERILIZING EFFECTS OF HIGH-INTENSITY AIRBORNE SONIC AND ULTRASONIC WAVES.

Michael A. Pisano, Raymond M. G. Boucher, and I. Edward Alcamo (St. John's University, Dept. of Biology, Jamaica, N.Y.; Macrossonics Corp., Carteret, N.J.).

Applied Microbiology, vol. 14, Sept. 1966, p. 732-736. 12 refs. Grant No. NsG-684.

The lethal effects of high-intensity airborne sonic (9.9 kc) and ultrasonic waves (30.4 kc) on spores of *Bacillus subtilis* var. niger ATCC 9372 were determined. The spores, which were deposited on filter-paper strips, were exposed to sound waves for periods varying from 1 to 8 hr, at a temperature of 40°C and a relative humidity of 40%. Significant reductions in the viable counts of spores exposed to airborne sonic or ultrasonic irradiations were obtained. The antibacterial activity of airborne sound waves varied with the sound intensity level, the period of irradiation, and the distance of the sample from the sound source. At similar intensity levels, the amplitude of motion of the sound waves appeared to be a factor in acoustic sterilization. (Author)

A67-14525 *

CHANGES IN ADRENAL CORTICOSTERONE CONCENTRATION IN RATS - METHOD OF BIO-ASSAY FOR ACTH.

Joan Vernikos-Danellis, Evelyn Anderson, and Leota Trigg (NASA, Ames Research Center, Environmental Biology Div., Moffett Field, Calif.).

Endocrinology, vol. 79, Sept. 1966, p. 624-630. 32 refs.

Method for the bio-assay of ACTH in 24-hr hypophysectomized rats. It is based on the increase in adrenal corticosterone concentration resulting from the intravenous administration of ACTH. Maximum adrenal corticosterone concentrations are attained 5 min after such an injection for the range of ACTH doses effective in this method. A rectilinear log-dose response relationship exists between the doses

of 25 to 200 μ U ACTH/rat. This method compares favorably in sensitivity, specificity, precision (mean $\gamma = s/b = 0.191$) and ease of performance with existing methods. Resting levels of ACTH, determined in 3-to-5-ml samples of rat or human plasma, are readily detectable. (Author)

A67-14535

HUMAN-ENGINEERING ASPECTS OF AUTOMATION AND RELIABILITY IN AIRCRAFT DESIGN [ANTHROPOTECHNISCHE ASPEKTE DER AUTOMATISIERUNG UND ZUVERLÄSSIGKEIT IM LUFTFAHRZEUGBAU].

H. von Diringshofen (Entwicklungsring Süd GmbH, Munich, West Germany).

Wissenschaftliche Gesellschaft für Luft- und Raumfahrt und Deutsche Gesellschaft für Raketentechnik und Raumfahrt, Jahrestagung 1966, Bad Godesberg, West Germany, Oct. 4-8, 1966, Paper, 9 p. In German.

Discussion of the human-engineering aspects of the design of future military high-performance aircraft. It is pointed out that such aircraft will require largely automatic controls to facilitate the pilot's task and that the resulting technical complexity will have to be compensated by improved electronic techniques, by redundancy, by automatic and semiautomatic checkout, and by the use of monitors. It is noted that under certain circumstances automation may render an intervention on the part of the pilot in case of serious technical disturbances more difficult. It is emphasized that this problem must be solved by improved displays, so that increased technical performance will not be achieved at the price of decreased reliability, due to overburdening of the pilot. A. B. K.

A67-14539 #

ANTHROPOTECHNIQUE AS A SCIENTIFIC DISCIPLINE [DIE ANTHROPOTECHNIK ALS WISSENSCHAFTLICHE DISZIPLIN]. R. Bernotat (Berlin, Technische Universität, Institut für Flugführung und Luftverkehr, Berlin, West Germany).

Wissenschaftliche Gesellschaft für Luft- und Raumfahrt und Deutsche Gesellschaft für Raketentechnik und Raumfahrt, Jahrestagung 1966, Bad Godesberg, West Germany, Oct. 4-8, 1966, Paper, 23 p. In German.

Discussion of subjects and problems treated in anthropotechnique - a new science defined as the science pertaining to the relationship between man and machine. The environmental layout, the dynamic adaptation of the machine to man, and the limits of intelligent machine handling are the aspects discussed specifically. Simulation methods are regarded as the most effective aids to the scientist who works in the field. V. Z.

A67-14544

PERFORMANCE OF MAN IN FLIGHT HANDLING AND FOLLOW-UP TASKS [DAS LEISTUNGSVERHALTEN DES MENSCHEN IN FLUGFÜHRUNGS- UND BEWEGUNGSFOLGEAUFGABEN].

Rüdiger Seifert (Entwicklungsring Süd GmbH, Munich, West Germany).

Wissenschaftliche Gesellschaft für Luft- und Raumfahrt und Deutsche Gesellschaft für Raketentechnik und Raumfahrt, Jahrestagung 1966, Bad Godesberg, West Germany, Oct. 4-8, 1966, Paper, 12 p. 9 refs. In German.

Assessment of the promptness of human reactions and shifts of attention during a flight. The capacity of a man to perform tracking tasks is found to be limited by his reactions. It is contended that the only systems that can be adequately controlled by a man are ones with control devices reducing the control characteristics so as to adapt control tasks to human abilities. The head-up display is believed to be the most effective design for the performance of tracking tasks. V. Z.

A67-14573 #

COMPATIBILITY OF ARTIFICIAL GAS MIXTURES UNDER HIGH AND LOW PRESSURE [ÜBER DIE VERTRÄGLICHKEIT KÜNSTLICHER GASGEMISCHE IM ÜBER- UND UNTERDRUCK].

H. Hartmann (Deutsche Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Bad Godesberg, West Germany).

Wissenschaftliche Gesellschaft für Luft- und Raumfahrt und Deutsche Gesellschaft für Raketentechnik und Raumfahrt, Jahrestagung 1966, Bad Godesberg, West Germany, Oct. 4-8, 1966, Paper, 26 p. In German.

Discussion of compatibility of artificial gas mixtures as being dependent on the carbon dioxide and oxygen partial pressure of the inert gases. While the carbon dioxide partial pressure should not exceed 0.005 atm, the level of the oxygen partial pressure is dependent on the time of exposure. The equation for calculating the time of exposure is given and the times for several different oxygen partial pressures are calculated. S. Z.

A67-14582 *

CELLULAR BIOCHEMISTRY AND ORGAN MASS OF COLD- AND HEAT-ACCLIMATED MONKEYS.

R. R. J. Chaffee, S. M. Horvath, R. E. Smith, and R. S. Welsh (California, University, Los Alamos Scientific Laboratory, Los Alamos, N. Mex.; California, University, Environmental Stress Institute, Santa Barbara; California, University, Center for Health Sciences, Los Angeles; California, University, Dept. of Life Sciences, Riverside, Calif.).

Federation Proceedings, vol. 25, July-Aug. 1966, p. 1177-1181; Discussion, p. 1182-1184. 40 refs.

Research supported by the Kaiser Foundation and AEC; U.S. Public Health Service Grants No. CA-04271-05; No. HD-01826-01; Contract No. DA-49-193-MD-2558; Grant No. NsG-721.

Study of the extent of chemical thermoregulation in lower primates, and comparisons with enzymatic and other organic changes seen previously in cold- and heat-acclimated rodents. Similar data have been obtained for adult monkeys chronically exposed either to cold, normal, or warm environments. In squirrel monkeys exposed to heat and cold, changes in organ weights were essentially the same as those seen in rodents. A number of oxidative enzymes, all of which change in temperature-exposed rodents, were assayed. Only three of these showed significant changes resembling those seen in rodents. Others showed no changes in response to temperature exposure. Except for the pancreas, changes in total DNA and RNA paralleled changes in total protein of the organs assayed. In the pancreas the increase in RNA of cold-exposed monkeys exceeded the increase in protein. Neither myoglobin nor hematoctrit levels changed in response to heat or cold exposure. F. R. L.

A67-14592 *

RESPONSES OF THE LATERAL GENICULATE NUCLEUS TO LIGHT INCREMENT AND DECREMENT AND THE ENCODING OF BRIGHTNESS.

Gerald H. Jacobs (Texas, University, Dept. of Psychology and Defense Research Laboratory, Austin, Tex.).

Vision Research, vol. 6, 1966, p. 83-87. 13 refs.

NSF Grant No. GB-4150; NASA Contract No. R-129; Contract No. Nonr-3579(04).

Two types of cells in the lateral geniculate nucleus of the monkey which transmit information signaling stimulus brightness show opposite changes in firing rate when the luminance of a stimulus light is shifted up or down. This observation suggests that, in the situation where the stimulus is rapidly changed in luminance, it is more likely the difference in firing rate between these two types of units than the total activity that is utilized to code brightness. A similar mechanism may operate to characterize the response to steady-state stimulation. (Author)

A67-14593 *

SEASONAL METABOLIC RESPONSES OF DEER MICE (PEROMYSCUS) TO TEMPERATURE AND ALTITUDE.

Jane C. Roberts, Raymond J. Hock, and Robert E. Smith (California, University, Dept. of Physiology, Los Angeles; California, University, White Mountain Research Station, Bishop, Calif.).

Federation Proceedings, vol. 25, July-Aug. 1966, p. 1275-1283; Discussion, p. 1284, 1285. 61 refs.

U.S. Public Health Service Grant No. GM-09261; Grant No. NsG-721.

Experimental investigation of the metabolic reaction of deer mice to temperature and altitude. Measurements of total metabolic rate (MR)² and body temperature (T_B) were made on animals native to and studied at sea level (SL) and at two laboratories located at 4000 and 12,470 ft. A number of enzyme systems were examined in the groups at sea level and at 12,470 ft. To compare cold effects with those of altitude, similar data were obtained on sea-level animals exposed to cold for six weeks. These effects were also compared with differences which appeared between summer- and winter-studied

A67-14603

wild mice. The analysis of the data obtained was aimed at developing criteria of adaptive responses to altitude and ambient temperature and at establishing the effect of overlying seasonal factors on these responses.

M.M.

A67-14603

WORKING IN SPACE - ARE WE READY?

Leo Bricker (Sylvania Electric Products, Inc., Sylvania Electronic Systems Div., Personnel Systems Section, Needham, Mass.). Space/Aeronautics, vol. 46, Oct. 1966, p. 68-76.

Survey of the role, mobility, maneuvering, tools, and techniques of the future astronaut engaged in doing mechanical work. The basic requirements are water-cooled underwear, as in the Apollo space suit; tether arrangement that prevents the astronaut from smashing into the mother ship, rocket-powered traversing devices, button-bonding to the work site, zero-reaction tools, and highly-efficient information and communication systems. The range of potential maneuvering systems applications to proposed missions is tabulated.

S. Z.

A67-14625 *

PHYSIOLOGICAL MONITORING.

Charles A. Berry (NASA, Manned Spacecraft Center, Houston, Tex.).

American Institute of Aeronautics and Astronautics, Annual Meeting, 3rd, Boston, Mass., Nov. 29-Dec. 2, 1966, Paper 66-928. 44 p. 10 refs.

Members, \$0.75; nonmembers, \$1.50.

Discussion of physiological monitoring as applied to man in the space environment. Emphasis is on overall philosophy, including the need for such monitoring. It was found possible to monitor physiological parameters of a space crew in orbital flight without undue interference with crew performance and comfort. The information available has been adequate and timely enough to allow decision making on crew physiological capability during various mission phases. It has also provided data for evaluating the effects of flight on various body systems and for planning future missions.

S. Z.

A67-14626

THE IMPORTANCE OF THE CAROTIDOGAM IN THE STUDY OF LEFT VENTRICULAR EJECTION [INTERET DU CAROTIDOGAMME DANS L'ETUDE DE L'EJECTION VENTRICULAIRE GAUCHE].

R. Carre (CEMPN, Paris, France), J. Pernod (Hôpital d'Instruction Percy, Service de Cardiologie, Percy, Manche, France), and N. Vasile.

Revue de Médecine Aéronautique, vol. 5, Apr.-June 1966, p. 7-9. In French.

Discussion of techniques and recording equipment used in taking carotidograms in the study of left ventricular ejection. The carotidogram was found to be important in the following fields: (1) as a diagnostic tool in disturbances of left ventricular ejection, (2) in heart physiology, for explorations of the dynamics of the left ventricle, and (3) in the pathological field, as a diagnostic tool in affections such as aortic stenosis, obstructive cardiomyopathy, and aortic insufficiency.

M.M.

A67-14627

DEVELOPMENT OF THE ASPECTS OF THE EEG DURING A TASK OF VISUAL SURVEILLANCE PERFORMED AT NIGHT [EVOLUTION DES ASPECTS E.E.G. AU COURS D'UNE TACHE DE SURVEILLANCE VISUELLE EFFECTUEE DE NUIT].

R. Angiboust, P. Galban, M. Gouars, and R. Vedel (Centre d'Expériences Aériennes Militaires, Laboratoire d'Etudes Médico-Physiologique, Mont-de-Marsan, Landes, France).

Revue de Médecine Aéronautique, vol. 5, Apr.-June 1966, p. 13-18, 7 refs. In French.

Experimental investigation of alertness during an assignment of visual surveillance carried out at night. The trend of the level of cortical activity, measured either by continuous recordings of the EEG during the assignment and by recording the EEG during 2-min periods under normal conditions with eyes closed, showed an overall parallel behavior to the trend of performance during the test. The effects of previous rest and of oxygen inhalation were investigated.

M.M.

A67-14628

CONJUNCTIVAL HYPEREMIA AND DISACCLIMATION TO ALTITUDE [HYPERHEMIE CONJONCTIVALE ET DESACCLIMATATION A L'ALTITUDE].

G. Raynaud and P. Manent.

Revue de Médecine Aéronautique, vol. 5, Apr.-June 1966, p. 19-21. In French.

Presentation of photographs of bilateral conjunctival hyperemias which are close to the clinical picture of chronic catarrhal conjunctivitis, are stubborn to customary treatment, and have the principal characteristic of occurring in chronic pulmonary patients living at high altitude (4200 m). Cardio-hemo-respiratory decompensation phenomena seem to be the primary cause of such ocular afflictions.

M.M.

A67-14629

METABOLIC CEREBELLUM CHANGES DURING EXPERIMENTAL HYPOXIA [MODIFICATIONS METABOLIQUES DU CERVELET AU COURS DE L'HYPOXIE EXPERIMENTALE].

R. Loubiere and A. Pfister.

Revue de Médecine Aéronautique, vol. 5, Apr.-June 1966, p. 23-29. 102 refs. In French.

Research supported by the Commissariat à l'Energie Atomique.

Histophotometric and radioautographic investigation of metabolic cerebellum changes under experimental nonlethal hypoxia, and estimation of the incorporation of marked amino acids in some cerebellar structures. The results obtained showed that during the symptomatic stage of hypoxia the system compensates the best it can and permits its vital cells, which are Purkinje's cells in the cerebellum, to function at a preferential pace. However, with the onset of the critical stage, these cells are affected the most, due to their having functioned for a long time at a very high pace.

M.M.

A67-14630

INTRODUCTION TO MEDICAL RESEARCH IN GLIDING - TAKING AN EKG IN A GLIDER [INTRODUCTION A LA RECHERCHE MEDICALE EN VOL A VOILE - PRISE D'ELECTROCARDIOGRAMMES A BORD DE PLANEUR].

Schalow and Bourdinand (Centre National de Vol-à-Voile, Saint-Auban-sur-Durance, Basses-Alpes, France).

Revue de Médecine Aéronautique, vol. 5, Apr.-June 1966, p. 33-37. In French.

Demonstration of the feasibility of conducting medical research in a glider. This is made possible by the introduction into the French market of a compact and simple electrocardiograph.

M.M.

A67-14631

DYNAMIC VENTILATORY WORK DURING MUSCULAR EXERTION AT AN ALTITUDE OF 2000 M [LE TRAVAIL DYNAMIQUE VENTILATOIRE AU COURS DE L'EXERCICE MUSCULAIRE A 2.000 D'ALTITUDE].

Ch. Jacquemin, P. Varene, and J. Timbal (Centre d'Essais en Vol, Laboratoire de Médecine Aérospatiale, Brétigny-sur-Orge, Seine-et-Oise, France).

Revue de Médecine Aéronautique, vol. 5, Apr.-June 1966, p. 39-40, 9 refs. In French.

Experimental investigation of dynamic pulmonary work of human males during muscular exertion at the altitude of 2000 m and at two different levels of barometric pressure, without taking into account acclimatization to altitude and training at altitude. The results obtained showed that, although it decreases somewhat at altitude due to the lower barometric pressure, dynamic pulmonary work increases with the amount of muscular exertion imposed. This fact has to be related with the increase in ventilation caused by the hypoxia due to altitude.

M.M.

A67-14632

REGARDING AN ISTHMIC LYSIS OF RARE LOCALIZATION OBSERVED IN A FIGHTER PILOT [A PROPOS D'UNE LYSE ISTHMIQUE DE LOCALISATION RARE OBSERVEE CHEZ UN PILOTE DE CHASSE].

R. P. Delahaye, R. Pannier, H. Mangin.

Revue de Médecine Aéronautique, vol. 5, Apr.-June 1966, p. 41, 42. In French.

Description of a very slight vertebral lesion found in a fighter pilot trainee during an X-ray checkup following a landing accident. The lesion was ascertained to be of congenital origin through an 8-year-old file. The finding suggested the advisability of instituting a radiographic reference file in order to prevent errors detrimental to a pilot's career. M.M.

A67-14633

INVESTIGATION OF THE EFFECTS OF ANTHOCYANIN GLUCOSIDES ON THE NIGHT VISION OF AIRPORT APPROACH CONTROLLERS [ETUDE DES EFFETS DES GLUCOSIDES D'ANTHOCYANE SUR LA VISION NOCTURNE DES CONTROLEURS D'APPROCHE D'AERODROME].

L. Belleoud, D. Leluan, and Y. Boyer.

Revue de Médecine Aéronautique, vol. 5, Apr.-June 1966, p. 45-50. In French.

Experimental investigation of the effectiveness of DIFRAREL 100 (consisting of anthocyanoside and beta carotene) in improving the night vision of airport controllers. The results showed that DIFRAREL 100 seems to be a quick and effective means for imparting excellent night vision to specialist air force personnel. M.M.

A67-14634

BIOLOGICAL EFFECTS OF HEAVY PARTICLES [EFFETS BIOLOGIQUES DES PARTICULES LOURDES].

H. Atlan.

Revue de Médecine Aéronautique, vol. 5, Apr.-June 1966, p. 53-57. 12 refs. In French.

Discussion of experimental results of investigations of the biological effects of heavy ions of primary cosmic rays. It is pointed out that quantitative studies have shown that the biological effects of heavy particles can be characterized by the following: (1) a general high coefficient of RBE (relative biological efficiency) due either to lethal or mutagenic effects attaining a peak and then diminishing in proportion to the increase in the LET (linear energy transfer), and (2) an effect of direct type which is independent of partial oxygen pressure and is largely irreversible. M.M.

A67-14798

CONJECTURES ON MAMMALIAN NEURON NETWORKS FOR VISUAL PATTERN RECOGNITION.

Sid Deusch (Brooklyn, Polytechnic Institute, Brooklyn, N.Y.).

(Symposium on Generalized Networks, Polytechnic Institute of Brooklyn, Brooklyn, N.Y., Apr. 12-14, 1966, Paper.)

IEEE Transactions on Systems Science and Cybernetics, vol. SSC-2, Dec. 1966, p. 81-85. 7 refs.

NSF Grant No. GK-710.

Based on Hubel's findings in the visual cortex of the cat, a short-line-extractor neuron configuration is considered as a correlative feature-extraction unit for visual pattern recognition. An array of 19 of these feature-extraction neurons is applied to test patterns consisting of the ten decimal digits. Subsequent processing by a group of memory neurons is equivalent to matrix multiplication. When all of the memory neurons are clamped to the same maximum output level, we get a symmetrical feature-difference matrix whose entries correspond to the summation of feature differences between incoming and memory patterns. (Author)

A67-14799

ADAPTIVE VISUAL SIGNAL PREPROCESSOR WITH A FINITE NUMBER OF STATES.

J. J. Kulikowski (Cambridge, University, Physiological Laboratory, Cambridge, England).

IEEE Transactions on Systems Science and Cybernetics, vol. SSC-2, Dec. 1966, p. 96-101. 11 refs.

A mathematical model representing certain aspects of how the eye processes pictures is given. The emphasis in modeling is on how the eye adapts to changes in signal intensity, SNR, and bandwidth. A few comparisons are made between the computed results of the model and of the psychophysical measurements to assess the limitations of artificial pattern recognition systems. (Author)

A67-15235 #

SPACESUIT SYSTEMS AND PENALTIES FOR INTERPLANETARY MISSIONS.

E. S. Mills (Douglas Aircraft Co., Missile and Space Systems Div., Advance Biotechnology Dept., Life and Environmental System Analysis Section, Santa Monica, Calif.).

(AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS, AND AMERICAN ASTRONAUTICAL SOCIETY, STEPPING STONES TO MARS MEETING, BALTIMORE, MD., MARCH 28-30, 1966, TECHNICAL PAPERS, p. 410-421.)

Journal of Spacecraft and Rockets, vol. 3, Dec. 1966, p. 1738-1744. 18 refs.

A67-15239 #

RELIABILITY AND STERILIZATION.

C. S. Bartholomew and D. C. Porter (Boeing Co., Aerospace Group, Seattle, Wash.).

Journal of Spacecraft and Rockets, vol. 3, Dec. 1966, p. 1762-1766.

Relationships between the electronic reliability requirements and spacecraft sterilization requirements have been studied. An optimistic view on the compatibility of the reliability and sterilization requirements for present electronic systems is projected. The demands for reliability and long life have created parts immune to temperature damage well above the time temperature dose requirements for sterilization. Exceptions exist such as certain classes of capacitors where the sterilization time temperature dose is clearly damaging. Step stress data identifying the damage threshold over a broad range of time temperature dosage is used to illustrate the wide margin above the sterilization requirement for certain part types. The possibility is examined of more effectively utilizing the resources available for heat sterilization compatibility verification by broadening the objective to better identify the damage thresholds and the relationships of environments and failure mechanisms. Decontamination with ethylene oxide gas is examined. The few problems that exist appear to be primarily caused by the water vapor used with ethylene oxide rather than the ethylene oxide itself. (Author)

A67-15245 * #

AN OPEN-CYCLE LIFE-SUPPORT SYSTEM FOR MANNED INTERPLANETARY SPACEFLIGHT.

J. Reece Roth (NASA, Lewis Research Center, Electromagnetic Propulsion Div., Cleveland, Ohio).

(AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS, AND AMERICAN ASTRONAUTICAL SOCIETY, STEPPING STONES TO MARS MEETING, BALTIMORE, MD., MARCH 28-30, 1966, TECHNICAL PAPERS, p. 130-136.)

Journal of Spacecraft and Rockets, vol. 3, Dec. 1966, p. 1791-1793. 14 refs.

A67-15398 #

MEASUREMENTS OF BODY MOTIONS.

Wilton W. Murphy, Daniel H. Garcia, and Robert G. Bird (General Electric Co., Command Systems Div., Apollo Support Dept., Human Performance Assessment Group, Daytona Beach, Fla.).

American Society of Mechanical Engineers, Winter Annual Meeting and Energy Systems Exposition, New York, N.Y., Nov. 27-Dec. 1, 1966, Paper 66-WA/BHF-2. 8 p.

Members, \$0.75; nonmembers, \$1.50.

The amplification of man's capability to perform load handling tasks through the use of manipulators, walking machines, and powered exoskeletons has resulted in an engineering requirement for a description and understanding of the biomechanics of the human body. Applicable information concerning the kinematics and kinetics of the various segments of the body while performing these types of tasks is not found in the literature. The paper presents examples of the type of biomechanics data required by the systems design engineer and a technique for data collection and analysis. Examples of the application of these data to design problems and also an advanced recording and analysis technique are outlined. (Author)

A67-15399 #**FATIGUE OF SELF-HEALING STRUCTURE - A GENERALIZED THEORY OF SELF-HEALING FAILURE.**

C. D. Nash, Jr. (Rhode Island, University, Kingston, R.I.).
American Society of Mechanical Engineers, Winter Annual Meeting and Energy Systems Exposition, New York, N.Y., Nov. 27-Dec. 1, 1966, Paper 66-WA/BHF-3. 4 p. 7 refs.
 Members, \$0.75; nonmembers, \$1.50.

A mathematical model is developed for the damaging effects of repeated trauma on self-healing biological structure. Terms are included for damage induced by aging and disease as well as the reduction in effective damage due to healing. This leads to an equation of the form $D = D_M + D_S + D_A - H$, where D represents the total damage at any time, D_M the damage associated with disease, D_S the damage due to generalized stress, D_A the irreversible damage due to aging, and H the damage repaired by healing processes. A linear theory is developed in which the various damage terms are independent of each other. In the general case, it is noted that interaction may occur between these damage terms, making them functions of one another. (Author)

A67-15400 * #**A KINEMATIC STUDY OF THE EFFECTS OF REDUCED GRAVITY ON SELF-LOCOMOTION.**

Amos A. Spady, Jr. (NASA, Langley Research Center, Hampton, Va.).

American Society of Mechanical Engineers, Winter Annual Meeting and Energy Systems Exposition, New York, N.Y., Nov. 27-Dec. 1, 1966, Paper 66-WA/BHF-6. 5 p.
 Members, \$0.75; nonmembers, \$1.50.

Discussion of the effect of such factors as gravity, pressure suits, and load carrying on man's self-locomotive capabilities on the lunar surface. Although the maximum walking and running speeds are decreased with decreased gravity, the optimum speed of self-locomotion is increased due to the unique character of the lunar lope. The lunar explorer will be able to jump higher and farther than on earth, and will be able to carry loads many times heavier. B. B.

A67-15401 #**AN ANALYTICAL MODEL TO DUPLICATE HUMAN DYNAMIC FORCE RESPONSE TO IMPACT.**

Thomas J. Wittmann (Technology, Inc., Dayton, Ohio).

American Society of Mechanical Engineers, Winter Annual Meeting and Energy Systems Exposition, New York, N.Y., Nov. 27-Dec. 1, 1966, Paper 66-WA/BHF-12. 8 p. 7 refs.
 Members, \$0.75; nonmembers, \$1.50.
 Contract No. AF 33(615)-2962.

Progressive refinement of the parameter values for a spring-mass-damper system representing the human body in the median sagittal plane to develop an analytical model capable of predicting the dynamic force response of human subjects to impact, using data collected in drop tower tests with human subjects. Under several different test conditions, the computed responses obtained by the model compared well with the measured responses of test subjects whose weight ranged from 130 to 230 lb. F. R. L.

A67-15402 #**REVIEW OF MATHEMATICAL MODELS WHICH DESCRIBE HUMAN RESPONSE TO ACCELERATION.**

Verne L. Roberts, C. T. Terry (Wayne State University, Biomechanics Research Center, Detroit, Mich.), and Ernest L. Stech (Frost Engineering Development Corp., Englewood, Colo.).

American Society of Mechanical Engineers, Winter Annual Meeting and Energy Systems Exposition, New York, N.Y., Nov. 27-Dec. 1, 1966, Paper 66-WA/BHF-13. 12 p. 58 refs.
 Members, \$0.75; nonmembers, \$1.50.

U.S. Public Health Service Grant No. AC-00054-08.

Review of the models which have been proposed to describe both the reaction of the human body as well as the specific response components of the body when placed in a dynamic environment. The response of bone and soft tissue as predicted by rheological models is first considered. Models have also been constructed for joints, appendages, the head and neck, the spine, and abdominal organs. Whole body models are described which fit experimental data reasonably well and are of use in engineering design calculations. F. R. L.

A67-15431 * #**DISSOCIATION OF HEAT PRODUCTION AND HEAT LOSS IN WORKING MEN.**

Paul Webb (Webb Associates, Yellow Springs, Ohio).

American Society of Mechanical Engineers, Winter Annual Meeting and Energy Systems Exposition, New York, N.Y., Nov. 27-Dec. 1, 1966, Paper 66-WA/HT-45. 6 p.

Members, \$0.75; nonmembers, \$1.50.

Contract No. NASw-1306.

Measurements of heat production by oxygen consumption and heat loss with a water-cooled suit have been made in active subjects thermally isolated from the environment by the clothing and chamber conditions employed. Heat production changes rapidly with changes in activity, followed more slowly by changes in heat loss - a temporal dissociation. In all experiments, sweating was minimal despite changing and sometimes very high work rates. The experiment records show O_2 uptake, Q (heat loss), mean skin temperature, and rectal temperature as continuous curves. (Author)

A67-15548**TURNOVER OF INDIVIDUAL PHOSPHOLIPID FRACTIONS IN THE RAT BRAIN DURING HYPOXIA.**

V. Ia. Dvorkin (Akademiia Nauk SSSR, Institut Fiziologii, Leningrad, USSR).

Nature, vol. 212, Dec. 10, 1966, p. 1239, 1240. 6 refs.

Experimental investigation of the content of individual phospholipids in the hemispheres of rat brains and of the rate of turnover of the phosphate groups during oxygen deprivation. The results obtained showed that the degree of depression of the rate of turnover of individual phospholipid fractions is different with the same degree of hypoxia. The part played by individual fractions in increasing hypoxia is also different. This suggested that the sensitivity of the metabolism of different phospholipid fractions to oxygen deprivation is not uniform. M. M.

A67-15667**CLOSED ECOLOGICAL SYSTEMS.**

Eugene B. Konecni (Texas, University, Austin, Tex.).

Space Science Reviews, vol. 6, Oct. 1966, p. 3-20.

Study of problems of providing adequate conditions of atmosphere, temperature, radiation, sanitation, hygiene, water, and food for the maintenance of human life. The life support systems program plan of NASA's Biotechnology and Human Research Office is discussed, and the use of a "boilerplate" space vehicle is described for simulated space flights of extended time periods to test a physico-chemical life support system which provides for the reclamation and reuse of water and oxygen for a four-man crew. B. B.

A67-15937 #**THEORY OF HUMAN VIBRATION RESPONSE.**

Fred Pradko (U.S. Army, Tank Automotive Center, Systems Simulation Branch, Warren, Mich.), Richard Lee, and Victor Kaluza (U.S. Army, Tank Automotive Center, Warren, Mich.).

American Society of Mechanical Engineers, Winter Annual Meeting and Energy Systems Exposition, New York, N.Y., Nov. 27-Dec. 1, 1966, Paper 66-WA/BHF-15. 13 p. 7 refs.
 Members, \$0.75; nonmembers, \$1.50.

Analytical and experimental studies of whole-body human dynamics under random vibration. The criteria of "absorbed power" is developed through the application of transfer functions; this method is applicable to assessment of the effects of stationary and nonstationary vibration records. The linearity of human response to vibration is established on a qualitative basis. The findings indicate that "absorbed power" and transfer function techniques may provide the basis for a universally usable human vibration measurement method which is applicable to air, sea, and land transportation media. B. B.

LC ENTRIES

A67-80161

DECREMENTAL AND INCREMENTAL VISUAL THRESHOLDS.

A. D. Short (Oxford U., Lab. of Physiol., Great Britain).
Journal of Physiology, vol. 185, Aug. 1966, p. 646-654. 20 refs.

Grant PHS B-1810 and Nuffield Found. supported research.

Extrafoveal decremental and incremental visual thresholds, in humans, were measured with a circular test-object of 57' diameter, an exposure time of 0.1 sec. and background luminance ranging from 2.5 to 7.3 log. quanta (equivalent to 507 nm) per second per square degree at the cornea. The decremental threshold is lower than the incremental threshold by factors up to 0.4 log. unit when the background luminance is low; and the two thresholds are virtually the same when the background luminance is high.

A67-80162

CHANGES IN NERVOUS SYSTEM FUNCTIONS AND OTHER SYSTEMS OF BODY DURING CONTINUOUS EXPOSURE TO ULTRA-HIGH FREQUENCY RADIATION [IZMENENIE FUNKTSII NERVNOI SISTEMY I NEKOTORYKH DRUGIKH SISTEM ORGANIZMA PRI KRONICHESKOM VOZDEISTVII RADIOVOLN SVCH-DIAPAZONA].

N. V. Tiagin and N. V. Uspenskaia.
Zhurnal Nevropatologii i Psikiatrii, vol. 66, no. 8, 1966, p. 1132-1136. 13 refs. In Russian.

Clinical examination of 108 subjects, 25-40 yr. who were engaged in working with machinery which created a field of ultra-high frequency (UHF) radio waves revealed a definite injurious effect on certain physiological functions. Most complaints were of an asthenic nature, such as fatigue, malaise, irritability, headache, dizziness, excessive sweating, blurred vision, hot flushes and sexual weakness. Workers around the UHF generator with an output of 100 $\mu\text{V}/\text{cm}^2$ developed fatigue in the afternoon. Two or three years of such work led to a development of chronic functional disorders in 57% of the cases. In most cases the clinical symptoms became quite severe in areas of reflexes, motor functions and trophic properties of the skin, nails and hair. The electroencephalograms showed moderate deviations from normal. The nervous system disturbances were often reflected in gastric secretory activity and endocrine functions. Cardiac function was also affected. Biochemical tests showed abnormal readings in most of the function tests.

A67-80163

DESOXYRIBONUCLEASE I ACTIVITY IN URINE OF IRRADIATED RATS UNDER THE CONDITIONS OF CYSTAMINE RADIOPROTECTION [AKTIVNOST' DEZOKSIRIBONUKLEAZY I V MOCHE OBLUCHENNYKH KRYS V USLOVIAKH ZASHCHITY TSISTAMINOM].

N. I. Libikova (S. M. Kirov Mil.-Med. Acad., Leningrad).
Radiobiologiya, vol. 6, no. 4, 1966, p. 583-586. 10 refs. In Russian.

Concentration of active desoxyribonuclease (DNA-ase) in urine can be used as an indication of the organism's exposure to the ionizing radiation. Groups of white rats were exposed to whole-body irradiation by X-rays with doses of 100 r, 350 r or 700 r. Their urinary DNA-ase was found to be higher than in normal animals. Treatment with cystamine, a radioprotector, prior to irradiation reduced the amount of excreted DNA-ase. The urinary increase of DNA-ase after the

exposure to the ionizing radiation is probably connected with a disturbance of the pancreas function and the digestive processes of the intestines. The cystamine effect may be due to the normalization of the intracellular biochemical processes, which results in an inhibition of tissue destruction.

A67-80164

EFFECT OF LEAD, BENZENE AND ALPHA-METHYLSTYROL ON THE RATE OF RADIOACTIVE METHIONINE INCLUSION IN THE PROTEINS CONTAINED IN DIFFERENT PORTIONS OF THE GASTROINTESTINAL TRACT [VLIANIE SVINTSA, BENZOLA I ALPHA-METILSTIROLA NA SKOROST' VKLIUCHENIIA RADIOAKTIVNOGO METIONINA V BELKI RAZLICHNYKH OTDEL'OV ZHELUDOCHNO-KISHECHNOGO TRAKTA].

L. L. Braginskaia and V. A. Sukhanova (Inst. of Hyg. and Prof. Diseases, Ufa, USSR).

Gigiena Truda i Professional'nye Zabolevaniia, no. 5, 1966, p. 26-30. 12 refs. In Russian.

In experiments on rabbits subjected to poisoning with benzene, alpha-methylstyrol and lead the authors investigated the rate of S^{35} -labeled methionine inclusion in the gastrointestinal tract mucosa proteins. Data were obtained proving varying intensity of the S^{35} -labeled methionine inclusion in different portions of the digestive tract of control rabbits. The highest radioactivity was noted to prevail in the proteins contained in the mucosa of the lesser curvature of the stomach and the pancreas. In subacute poisoning of rabbits with benzene and alpha-methylstyrol one could see emerging depression of the intensity marking inclusion of radioactive methionine in proteins contained in most parts of the gastrointestinal tract and, particularly, in proteins of the pyloric segment of the stomach and the pancreas. In chronic lead poisoning an increased intensity of the radioactive methionine inclusion in the small intestine mucosa proteins was recorded.

A67-80165

CHARACTERISTICS OF CLINICO-PHYSIOLOGICAL CHANGES IN OPERATORS EXPOSED TO THE EFFECT OF SCATTERED CONTINUOUS MAGNETIC FIELDS IN INDUSTRIAL AND LABORATORY CONDITIONS [KHARAKTERISTIKA KLINIKO-FIZIOLOGICHESKIKH IZMENENII U RABOTNIKOV, PODVERGAUSHCHIKHSIA V PROIZVODSTVENNO-LABORATORNYKH USLOVIAKH VOZDEISTVIU RASSEIANNYKH POSTOIANNYKH MAGNITNYKH POLEI].

A. M. Vialov and Z. S. Lisichkina (F. F. Erisman Inst. of Hyg., Moscow, USSR).

Gigiena Truda i Professional'nye Zabolevaniia, no. 5, 1966, p. 39-43. 15 refs. In Russian.

Biological effect of scattered magnetic fields was studied in workers employed in manufacturing of permanent magnets. The magnetic inducers used were either permanent magnets or electromagnets fed by the 10 kv generators with 50 c.p.s. frequency. In the electromagnetic fields generated the worker's body was exposed to about 150 oersted. However, hands used for placing and withdrawing parts to be magnetized by the solenoid were exposed to magnetic fields of about 260-1,000 oersted. The workers were exposed to magnetic fields on the average of 2-2 1/2 hr./day. However, medical examination of workers showed that some subjects exhibited disturbances in various biological systems including the nervous system. The hands were affected considerably. The wrists showed erythema and were painful. There was pronounced sweating of palms. Prophylactic measures were required to prevent these undesirable effects.

A67-80166

COMBINED EFFECT OF SPACE FLIGHT FACTORS ON SOME FUNCTIONS OF THE BIOLOGICAL ORGANISM [KOMBINIROVANNYE VOZDEISTVIA FAKTOROV KOSMICHESKOGO POLETA NA NEKOTORYE FUNKTSII ORGANIZMA].

G. M. Frank, N. N. Livshits, M. A. Arsen'eva, Z. I. Apanasenko, L. A. Beliaeva, A. V. Golovkina, V. Ia. Klimovitskii, M. A. Kuznetsova, L. D. Luk'ianova, and E. S. Meizerov (USSR Acad. of Sci., Inst. of Biol. Phys., Moscow).

Investiia Akademii Nauk SSSR. Seriya Biologicheskaiia, no. 5, Sep.-Oct. 1966, p. 625-643. 40 refs. In Russian.

A series of experiments was conducted to determine the effects of space flight factors on central nervous system function and the processes of mitosis in the hemopoietic tissues of guinea pigs, rats, and mice. The following factors were studied: (1) the effects of radial acceleration in the centrifuge; (2) the combined effects of vibration and ionizing radiation; and (3) the combined effects of vibration, acceleration, and ionizing radiation, particularly in large doses, and as observed after a long period of time. Because of the various mechanisms involved in each case, the results varied greatly. Often the effect of one factor was increased by additional stress, yet in other cases the effect was reduced, or had no bearing on the first factors. Probable mechanisms and processes are considered.

A67-80167

HUMAN-OPERATOR WITH THE DOUBLE FUNCTION [OPERATOR S DVOINOI FUNKTSIEI].

Zh. M. Faverzh (Brussels Free U., Belgium).

Voprosy Psikhologii, no. 4, Jul. Aug. 1966, p. 22-25. In Russian.

An analysis of human-operator's activity in a number of French and Belgian industrial enterprises showed that the human-operators carry out simultaneously two interdependent but often different functions. The first function consists of carrying out definite tasks of production (industrial operations). The second, broader function is to keep the whole system running in an optimum state. By examples (dispatcher, quality monitor, miner, etc.) the author shows how these human operators solve the problem in carrying out two functions simultaneously depending upon factory requirements, production experience, etc., and what are the results in case of one function being more important than the other.

A67-80168

GENERAL STRUCTURE OF HUMAN-OPERATOR'S ACTIVITY AND SOME CONDITIONS FOR ITS FORMATION [OBSHCHAIA STRUKTURA DEIATEL'NOSTI OPERATOROV I NEKOTORYE USLOVIA EE FORMIROVANIIA].

E. A. Milerian and O. P. Shvetsov (Inst. of Psychol., Kiev, UkrSSR).

Voprosy Psikhologii, no. 4, Jul. Aug. 1966, p. 74-86. 16 refs. In Russian.

A description of the general aspects of operator's activity and some results of an experimental investigation of psychological characteristics of the formation of separate phases of this activity in 40 subjects are presented. A specially designed technique enabled the authors to establish that in the process of prolonged training at a remote-control panel elementary and little productive methods of information perception and processing gradually changed into more generalized, abbreviated and effective methods of perceptual problem-solving. The adequate identification of the image of the trajectory of movement of the perceived object plays a positive role in the formation of operator's skills and enables subjects to use a strategy of actions anticipating the course of events. Concrete ways are outlined for improving methods of psychological selection and training of the operators.

A67-80169

DEVICE FOR MEASURING PROBABILISTIC CHARACTERISTICS OF ELECTROENCEPHALOGRAM [USTANOVKA DLIA IZMERENIIA VEROIATNOSTNYKH KHARAKTERISTIK ELEKTROENTSEFALOGRAMMY].

V. A. Prianishnikov and E. Ia. Voitinskii.

Voprosy Psikhologii, no. 4, Jul. Aug. 1966, p. 154-159. 8 refs. In Russian.

An automatic electronic device is described for measuring monodimensional functions of distribution of electroencephalogram signals and other biopotentials. The device measures integral and differential functions of distribution of amplitudes and durations of overshoots with no more than 2% error. It can be used in experimental and clinical electrophysiology. Four schematic outlines of the circuitry are included.

A67-80170

EFFECTS OF ADDING A STIMULUS DIMENSION PRIOR TO A NONREVERSAL SHIFT.

Donald E. Guy, Frederick M. Van Fleet, and Lyle E. Bourne, Jr. (Colo. U., Denver).

Journal of Experimental Psychology, vol. 72, Aug. 1966, p. 161-168. 14 refs.

Grant NIMH MH-08315

In a concept-identification task, subjects attained an unidimensional solution (Stage 1), then used that solution to classify stimulus patterns which embodies an additional dimension of variation (Stage 2), and finally discovered a new solution determined by a nonreversal (NR) shift to the added dimension (Stage 3). In Experiment I, the added dimension was either irrelevant to correct responding (Cond. I) or redundant with the initially relevant dimension (Cond. R) in Stage 2. Performance in Stage 3 was significantly better in Cond. R than in Cond. I. The results of Experiment II, including Cond. IR for which the added dimension was intermittently reinforced during Stage 2, were compatible with those of Experiment I, performance in Cond. IR fell midway between Cond. I and R. The outcome was interpreted within contrasting frameworks of cue conditioning and hypothesis testing models of concept identification.

A67-80171

ADAPTATION TO PRISMATIC DISPLACEMENTS: HAND POSITION AND TARGET LOCATION.

Robert Wm. Sekuler and Joseph A. Bauer, Jr. (Mass. Inst. of Technol., Cambridge)

Journal of Experimental Psychology, vol. 72, Aug. 1966, p. 207-212. 7 refs.

NASA Grant NSG 496, Grants NSF GB 22728, NIMH MH 7642, and AFOSR 354-63.

Interpretation of studies of prismatic changes in the apparent relationship between hand and eye may be complicated by possible sources of artifact, including failure to control the position of subject's hand during prism viewing. The subject used a stylus to mark the location of virtual image targets before and after viewing the marking hand through prisms. Differences between pre- and postexposure markings measured the effect of the intervening exposure. Independent variables included the direction in which prism displaced seen objects, position of the marking hand during exposure, and location of the targets to be marked. Although all three factors proved highly significant ($p > .005$), the effect of prism orientation was about four times as great as the other effects. The implications of these findings for research on prism adaptation are discussed.

A67-80172

BACKWARD MASKING AND MODELS OF PERCEPTUAL PROCESSING.

Naomi Weisstein (Chicago U., Comm. on Math. Biol., Ill.). *Journal of Experimental Psychology*, vol. 72, Aug. 1966, p. 232-240. 9 refs.

Grant PHS MH-O3244.

The decision between parallel and serial operations in perceptual processing has always been made on the basis of whether or not, as a visual array size increases, there is a total increase in time from presentation to report. The results from this type of design are ambiguous; no operation within the perceptual processing sequence itself is measured, thus it is equally likely that additional operations are being added or that the operations are repeating themselves. A design using U-shaped backward-masking functions provided a measure of an operation occurring within the processing sequence; the duration over which this operation occurred for arrays of different sizes reflected the type of processing occurring. There was an increase in masking range as array size increased; thus, no strict parallel processing occurs. Since these increases were not whole multiples of the increase in array size, the processing is not serial, item-by-item. These results have some general implications for visual backward masking.

A67-80173

BACKWARD RECALL WITH COMPOUND STIMULI.

Robert K. Young, Jonelle M. Farrow, Sue Seitz, and Mary Hays (Tex. U., Austin).

Journal of Experimental Psychology, vol. 72, Aug. 1966, p. 214-243.

Backward (R-S) recall was measured following the learning of a paired-associate (PA) task in which compound stimuli, each consisting of a nonsense syllable and a color, were employed. Two levels of stimulus meaningfulness were used, and within each level subjects recalled either colors or nonsense syllables. Two control groups learned PA lists with nonsense-syllable stimuli. An interaction between stimulus meaningfulness and stimulus-component recalled was obtained between the experimental groups during recall.

A67-80174

CONSOLIDATION AND RETROACTIVE INTERFERENCE IN SHORT-TERM RECOGNITION MEMORY FOR PITCH.

Wayne A. Wickelgren (Mass. Inst. of Technol., Cambridge). *Journal of Experimental Psychology*, vol. 72, Aug. 1966, p. 250-259. 18 refs.

NASA Grant NsG 496 and Grant NIMH MH 088-90-01.

Subjects listened to a standard tone for two, four, or eight sec., followed by an interference tone lasting two, four, or eight sec., followed by a comparison tone lasting two sec., followed by a four-sec. period in which they decided whether the standard and comparison tones were the same or different and stated their confidence on a scale from one to five. Operating characteristics were approximately straight lines on normal-normal paper, and d' values were computed for each condition for each of ten subjects. The d' value for a condition is a measure of the difference in strength of the correct and incorrect comparison tones at the time of the test, greater d' meaning more accurate performance. By this measure, trace strength increased with longer duration of the standard tone, decreased with longer duration of the interference tone, and generalized to adjacent tones.

A67-80175

BRIGHTNESS ENHANCEMENT IN INTERMITTENT LIGHT: METHODS OF MEASUREMENT.

Gerald S. Wasserman (Mass. Inst. of Technol., Cambridge). *Journal of Experimental Psychology*, vol. 72, Aug. 1966, p. 300-306. 17 refs.

NASA Grant NsG 496 and Grant NIH F1-MH-22, 408-01.

Brightness enhancement was measured under four conditions of judgment (simultaneous or successive comparisons and in the presence or absence of an adapting field) in a 2X2 factorial design. Brightness enhancement was greater for successive comparisons than for simultaneous comparisons. Enhancement was also favored when the adapting field was removed during the comparisons. The greatest amount of enhancement, then, was found when the intermittent light was isolated in space and time from all other stimuli, thus contradicting the suggestion that brightness enhancement might be an interaction artifact. However, these results also demonstrate that brightness enhancement is sensitive to the presence of other stimuli. Introspections of observers suggest that subjective colors were produced to a greater degree during simultaneous comparisons than during successive comparisons.

A67-80176

THE CRITERION PROBLEM IN SHORT-TERM MEMORY.

Bennet B. Murdock, Jr. (Toronto U., Canada).

Journal of Experimental Psychology, vol. 72, Sep. 1966, p. 317-324. 18 refs.

Grants NIMH MH 03.330 and 10.882.

According to signal-detection theory the response is a function of both sensitivity and the criterion; this experiment tested for criterion shifts in short-term memory (STM). Each list consisted of five A B paired associates followed by a probe (A or B) for one of the pairs. Four subjects were tested intensively, and recall was supplemented with confidence ratings and latency measures. Analysis of the results showed that the strength of the evoked response (as measured by d') was invariant over serial position but the criterion (as measured by β) became stricter as retention interval increased. Thus the predicted changes did occur; these findings raise doubts about conventional error analyses in studies of human verbal learning and suggest caution in extrapolating from probability measures to strength measures.

A67-80177

EFFECT OF CHANGE IN SEQUENTIAL VISUAL STIMULI ON GSR ADAPTATION.

Robert Fried, Sam J. Korn, and Livingston Welch (N. Y. City U., Hunter Coll., New York).

Journal of Experimental Psychology, vol. 72, Sep. 1966, p. 325-327.

Galvanic skin response records were obtained for 20 subjects while they were presented with a series of 80 stimuli (four lights alternating in apparently random sequence). Records were obtained for 20 additional subjects using the same procedure, except that a novel stimulus (a light not previously presented) was substituted in place of one of the original four lights. Typical adaptation phenomena were observed for both groups. While the novel stimulus was perceived by all subjects in the second group, it had no effect on the adaptation curve for that group. It is concluded that novelty is a dimension which needs considerable re-examination.

A67-80178

CHANGES WITHIN AND OVER REPEATED SESSIONS IN CRITERION AND EFFECTIVE SENSITIVITY IN AN AUDITORY VIGILANCE TASK.

John R. Binford (Louisville U., Ky.) and Michel Loeb (U.S. Army Med. Res. Lab., Fort Knox, Ky.).

Journal of Experimental Psychology, vol. 72, Sep. 1966, p. 339-345. 15 refs.

U.S. Army supported research.

The sensitivity and criterion indexes, d' and β , of signal-detection theory were calculated and used as measures descriptive of vigilance performance, and trends were studied in

terms of these indexes in addition to the usual ways involving detections and false alarms. Subjects were run under two conditions: (a) 1/2 the subjects employed a multiple criterion, i.e., indicated their degree of confidence at one of three levels when they thought they detected a signal; (b) 1/2 the subjects merely indicated the occurrence of a signal (single criterion). All subjects performed the same task—detection of a 18-dB increment to periodically occurring 60-dB noise pulses for nine 80-min. sessions. It was found that (a) d' decreased slightly during sessions and increased slightly over sessions; (b) criterion indexes, β , increased both within and over sessions; (c) subjects employing a single criterion, i.e., single standard of judgment showed more pronounced trends than did subjects employing multiple criterion. The usual changes in Hits and False Alarms, i.e., decreases in detections within sessions (especially the early sessions) and decreases in false alarms within and over sessions were observed.

A67-80179
CONSERVATISM IN A SIMPLE PROBABILITY INFERENCE TASK.

Lawrence D. Phillips and Ward Edwards (Mich. U., Ann Arbor) *Journal of Experimental Psychology*, vol. 72, Sep. 1966, p. 346-354, 8 refs.
 Contract AF 19(628)-2823.

Three experiments investigated the effects on posterior probability estimates of (a) prior probabilities, amount of data, and diagnostic impact of the data; (b) payoffs, and (c) response modes. In all the experiments subjects usually behaved conservatively, i.e., the difference between their prior and posterior probability estimates was less than that prescribed by Bayes' theorem. Conservatism was unaffected by prior probabilities, remained constant as the amount of data increased, and decreased as the diagnostic value of each datum decreased. More learning occurred under payoff than under nonpayoff conditions and between-S variance was less under payoff conditions. Estimates were most nearly Bayesian under the (formally inappropriate) linear payoff, but considerable overestimation resulted; the log payoff condition yielded less conservatism than the quadratic payoff. Estimates were most nearly Bayesian when subjects estimated odds on a logarithmic scale.

A67-80180
ACQUISITION AND RETENTION IN SHORT-TERM MEMORY.

Donald A. Norman (Harvard U., Cambridge, Mass.) *Journal of Experimental Psychology*, vol. 72, Sep. 1966, p. 369-381, 15 refs.
 Grant NIH MH-08083-02

Retention in short-term memory was studied by manipulating rates of presentation (from one to ten digits per second), the type of digit presentation (spoken, computer spoken, and visually presented), the type of item (single digits, paired digits, and nonsense sounds), and the type of test (recall and recognition). Performance in short-term memory experiments is attributed to interactions among three different processes: acquisition, retention, and decision. Rate of presentation, length of list, type of item, and modality seemed mainly to affect the initial acquisition of items in memory. The rate of forgetting depended mainly upon the number of items presented between the critical item and its test.

A67-80181
INFERENCE ON THE BASIS OF CONDITIONALLY NON-INDEPENDENT DATA.

David A. Schum (Ohio State U., Columbus) *Journal of Experimental Psychology*, vol. 72, Sep. 1966, p. 401-409
 Contract AF 33(657)-10763.

The purpose of this experiment was to evaluate the ability of subjects to exploit conditional data nonindependence in making inferences in the form of subjective posterior probability estimates. Subjects' posterior probability estimates were compared with those prescribed by Bayes' theorem. Two of three subjects processed data exhibiting conditional nonindependencies. These nonindependencies, if recognized and exploited, had significant inferential value. Subjects' posterior probability estimates on the basis of the nonindependent data were in close agreement with those prescribed by Bayes' theorem. The conservatism frequently observed when subjects estimate posterior probabilities was absent in the present experiment.

A67-80182
INVERSE FORGETTING IN SHORT-TERM MEMORY.

June Crawford, Earl Hunt, and Grahame Peak (Sydney U., Australia) *Journal of Experimental Psychology*, vol. 72, Sep. 1966, p. 415-422, 13 refs.
 Grant NIMH MH-07567.

As a test of short-term memory, human subjects were shown a pattern of letters, then asked to recall it. Stimuli were presented for less than one sec., while the retention interval varied from one to ten sec. The letter patterns used were either meaningless, formed words, or formed sentences. There was no intervening activity during the retention interval. Accuracy of recall was higher at longer retention intervals, in contrast to the usual fall of accuracy with time which is seen when retention is measured over a period of minutes or longer. Degree of meaningfulness of the stimuli did affect accuracy of recall, but there was no interaction with the retention interval effect.

A67-80183
AROUSAL, ADAPTATION LEVEL, AND ACCENTUATION OF JUDGMENT.

Wolfgang Schönplug (Frankfurt U., West Germany) *Journal of Experimental Psychology*, vol. 72, Sep. 1966, p. 443-446, 8 refs.

Four experimental groups estimated the duration of a constant time interval presented repeatedly. Subjects were either occupied with a counting task during the estimation interval or were listening to the sound of a buzzer. In addition, level of arousal was manipulated by the amount of physical work subjects were engaged in before the ratings. Intervals were classified as short under the counting condition, and as long under the listening condition. Estimates of time intervals classified as long increased, estimates of intervals classified as short decreased as a function of arousal. With repeated presentations, all judgments approached an intermediate, neutral point on the rating scale under conditions of lower, but not under conditions of higher arousal. The results are interpreted as evidence for a positive relation between extent of energy mobilization and deviation from a hypothetical adaptation level.

A67-80184
ACCURACY OF ABSOLUTE VISUAL DISTANCE AND SIZE ESTIMATION IN SPACE AS A FUNCTION OF STEREOPSIS AND MOTION PARALLAX.

James W. Dees (McDonnell Aircraft Corp., St. Louis, Mo.) *Journal of Experimental Psychology*, vol. 72, Sep. 1966, p. 466-476.

Three experiments were performed on the accuracy of distance estimation in space as a function of stereopsis alone, stereopsis plus motion parallax, and motion parallax alone using a motion-picture stereoscope. The motion parallax was induced by a simulated head motion. During training, subjects

received 10 sets of 20 discrete distance presentations each and were asked to identify them as to distance as they were presented and were immediately informed of the correct answer. The identifying code used was a rank order. Procedure was repeated during testing except knowledge of results was omitted. Equations, expressing the median and the dispersion of judged distance were given as a function of actual distance. With proper training, a cyclical head motion can add significantly to the accuracy of distance and size estimation. The equipment and techniques are described. The moon illusion is discussed relative to an informal observation made during the experiment.

A67-80185
IS THE FIGURAL AFTEREFFECT AN AFTEREFFECT? A REVIEW OF ITS INTENSITY, ONSET, DECAY, AND TRANSFER CHARACTERISTICS.

Leo Ganz (Calif. U., Riverside)
Psychological Bulletin, vol. 66, Sep. 1966, p. 151-165. 64 refs.

It has been shown how figural aftereffects might be generated by the lateral inhibitory effects of the inspection figure, in the manner of a simultaneous illusion. The present effort reviews some evidence suggesting that a figural aftereffect is a simultaneous illusion: (a) varying the intensity of the inducing figure affects the simultaneous illusion and figural aftereffect in similar ways; (b) temporal characteristics-onset and decay of light adaptation, of afterimages, and of figural aftereffects are considered; and (c) the argument that the use of an interocular presentation of inducing and test figure eliminates the possible influence of afterimages is reviewed. It is concluded that figural aftereffects are very closely related to three visual phenomena: simultaneous contrast (the result of lateral inhibition), light and dark adaptation, and ocular tremor.

A67-80186
POWER LAW FITS TO MAGNITUDE ESTIMATES OF GROUPS AND INDIVIDUALS.

David Freides and Patricia Phillips (Wayne State U., Detroit, Mich.)
Psychonomic Science, vol. 5, Aug. 5, 1966, p. 367-368. 12 refs.

Differential sensitivity to grit and weight stimuli was compared for lateral differences using power law coefficients based on unanchored magnitude estimations. Subjects were 120 college students run in a parametric design with sex, handedness, and order of testing right and left controlled. Findings on lateral differences were unreliable. Power law functions were shown to fit group ($N = 10$) data consistently but not individuals. These results indicate that without specification of several implicated variables, the use of unanchored magnitude estimations and the power law to compare sensory functions in individuals is of dubious validity.

A67-80187
ENVIRONMENTAL HEAT, BODY TEMPERATURE AND BEHAVIOUR: AN HYPOTHESIS.

K. A. Provins (Adelaide U., Australia).
(Australian Arid Zone Conf., 2nd, Alice Springs, Sep. 13-17, 1965).

Australian Journal of Psychology, vol. 18, Aug. 1966, p. 118-129. 48 refs.

Recent experimental evidence of the effect of acute exposure to environmental heat on human skilled performance suggests that an increase in body temperature rather than a rise in the effective climatic temperature is the real source of heat stress. A hypothesis is proposed which explains the

effect of increase in body temperature in terms of an increase in the general level of arousal of the individual, but it is suggested that a simultaneous measure of both level of activation and level of achievement is necessary to determine the efficiency of human performance on a given task in any given climate. The degree of arousal recorded in a particular situation can be considered to indicate the total "cost" of work climate combination, and it is suggested therefore that an increase in body temperature is likely to become stressful when the degree of activation exceeds the optimum value for performance on the task concerned. Chronic exposure to environmental heat probably has its effects on behaviour (where these occur) through continuous arousal of the individual such that inadequate rest is obtained and the person concerned is effectively suffering from sleep deprivation.

A67-80188
BACKGROUND FACTORS IN AIRLINE MECHANICS' WORK MOTIVATIONS: A RESEARCH NOTE.

Tripit Narayan Singh and Howard Baumgartel (Kan. U., Lawrence).
Journal of Applied Psychology, vol. 50, Oct. 1966, p. 357-359. Kan. U. supported research.

A correlational analysis of a number of questionnaire items assessing the importance of various aspects of the work situation showed two themes: one referred primarily to needs for advancement and the other to needs for security and stability in job and interpersonal relations. Level of educational achievement bears a positive relationship with advancement motivation. Age is, independently, negatively related to advancement needs. Trends exist to indicate converse relationships between education and age and the need for security and stability.

A67-80189
EFFECT OF SWITCH CONFIGURATION ON THE OPERATION OF A SWITCH MATRIX.

R. S. Lincoln and S. A. Konz (Lockheed Missiles and Space Co., Sunnyvale, Calif.)
Journal of Applied Psychology, vol. 50, Oct. 1966, p. 375-382. 5 refs.
 Contract AF 04(695)-207.

In a series of three experiments the speed and accuracy of switch-matrix operations were determined for five different matrix configurations. Factors influencing performance included switch orientation (whether row or column), reach distance, and the type of symbol with which the switches were labeled. Response time was the only important performance measure. Error rates were negligible for all configurations.

A67-80190
INFORMATION ASSIMILATION FROM UPDATED ALPHA-NUMERIC DISPLAYS.

Charles H. Hammer and Seymour Ringel (U.S. Army Personnel Res. Office, Washington, D. C.)
Journal of Applied Psychology, vol. 50, Oct. 1966, p. 383-387.

The accuracy with which subjects could locate updated elements of information was studied as a function of use of coded vs. uncoded updates, number of elements of information presented and number of elements of information updated. Selected findings demonstrate the value of coding as an information enhancement technique and the considerable effects of elements presented and updated. With uncoded displays, a reduction in the percentage of responses as the number of updates increased may reflect a lessening of subjects' confidence in their ability to make correct responses even though their actual performance did not appear to suffer.

A67-80191
EVIDENCE FOR EARLY ANOXIC-ISCHAEMIC CELL DAMAGE IN THE RAT BRAIN.

A. W. Brown and J. B. Brierley (Med. Res. Council Labs., Neuropsychiat. Res. Unit, Carshalton, Great Britain).
Experientia, vol. 22, Aug. 15, 1966, p. 546-547. 11 refs.

The application of standard neuropathological techniques to Levine preparations (1960) was employed to demonstrate early ischemic cell change in the brain of rats after a long period of exposure to nitrogen. Blood flow in the right common carotid artery was interrupted either by ligation or by a clamp, and the animal was placed in the nitrogen flow at 5 liters per min. Convulsions usually occurred within 15-25 sec. and apnea within one min. After artificial respiration the animal was returned to nitrogen atmosphere. The procedure was repeated with total period of apnea equal to 40 min. During exposure 40% of the animals died. In 80% of the surviving animals, histological examination of the brain showed abnormality and swelling of the ipsilateral hemisphere. The necrosis involved the neocortex, pyriform cortex, hippocampus, corpus striatum, thalamus, and amygdaloid nucleus. These areas showed typical ischemic cell changes and a destruction of neurons. Histological changes and stages of ischemic changes are described.

A67-80192
PROBLEM OF RADIOPROTECTIVE PROPERTIES OF ANTI-OXIDANTS [K VOPROSU O ZASHCHITNYKH SVOISTVAKH ANTIKSIDANTOV].

R. B. Streikov and L. F. Semenov (USSR, Acad. of Med. Sci., Inst. of Exptl. Pathol. and Therapy, Sukhumi).
Radiobiologiya, vol. 6, no. 4, 1966, p. 578-579. 7 refs. In Russian.

Derivatives of gallic acid, sodium and propyl salts and inositol, were used together with cystamine and mexamine (metoxytryptamine) as radioprotectors in exposure of white mice to gamma radiation. The gallic acid derivatives did not show any prophylactic or therapeutic properties while cystamine and mexamine were effective in 40% of the cases.

A67-80193
PROBLEM OF RADIOPROTECTIVE ACTION OF PYROGENS [K VOPROSU O RADIOZASHCHITNOM DEISTVII PIROGENOV].

N. A. Kalinina (USSR, Acad. of Med. Sci., Inst. of Exptl. Med., Leningrad).

Radiobiologiya, vol. 6, no. 4, 1966, p. 580-582. In Russian.

Killed cultures of *Bacillus mesentericus* were used for testing a possible pyrogenic effect on radiation sickness in white rats. The vaccine was injected subcutaneously before and after the exposure to radiation of 800 r. The number of surviving animals in each group was taken as an indication of vaccine efficiency. Only injections of vaccine three times (48, 24 and 4 hr.) before the radiation exposure produced survival of about 21% of the animals. In order to test the stimulating effect on the hematopoietic system, and eliminate the possible effect of the hypophysis-adrenal system, the experiment was repeated on adrenalectomized animals, who were exposed to a smaller dose of 600 r. Removal of adrenals did not interfere with radioprotective effect in a small number of animals. However, no radiation protection effect was noted when the experimental animals were anesthetized. No marked changes were noted in the blood picture. The mechanism of possible radioprotective effect may be due to the effect on the central nervous system.

A67-80194
TOXICOLOGICAL CHARACTERISTICS OF INDIUM ANTIMONIDE AND GALLIUM ARSENIDE—A GROUP OF NEW SEMICONDUCTORS [TOKSIKOLOGICHESKAIYA KHARAKTERISTIKA ANTIMONIDA INDIYA I ARSENIDA GALLIYA—NOVYKH POLUPROVODNIKOVYKH MATERIALOV].

T. A. Roshchina (I. M. Sechenov Med. Inst., Moscow, USSR).
Gigiena Truda i Professional'nye Zabolevaniya, no. 5, 1966, p. 30-33. 5 refs. In Russian.

Toxic properties of the new semiconductors gallium arsenide and indium antimonide, are discussed. Experiments were conducted on guinea pigs and rabbits as a series of acute, subacute and chronic tests. Both compounds were found to possess minimum toxicity in acute tests following administration per os, with LD₅₀ for GaAs 4.7 gm/kg. and for InSb 3.7 gm/kg. A delayed absorption of these substances into the organism (introduced per os) was found to be capable of producing a general toxic effect. The highest toxicity was registered after intratracheal administration, with alterations occurring in the pulmonary tissue (interstitial and desquamous pneumonias) and dystrophic changes in parenchymatous organs. Prevention of a toxic effect of the dust of these compounds upon workers is recommended.

A67-80195
TOXICOLOGICAL CHARACTERISTICS OF MONOCHLORODIBROMOTRIFLUORETHANE (MDTE) [TOKSIKOLOGICHESKAIYA KHARAKTERISTIKA MONOKHLORDIBROMOTRIFTORETANA (MDTE)].

O. N. Nemirovskii (Sanit. Hyg. Med. Inst., Leningrad, USSR).
Gigiena Truda i Professional'nye Zabolevaniya, no. 5, 1966, p. 34-38. 17 refs. In Russian.

Monochlorodibromotrifluorethane (MDTE) is widely used in various industries as freon, hydraulic liquid, dielectric and for diverse kinds of organic synthesis. To test the MDTE inhalation poisoning in albino mice the LC₅₀ was set at 22 mg/liter of ambient air. In subacute and chronic poisoning the animals showed disorders of the central nervous system, as well as of carbohydrate and cholesterol metabolism. The poisoning resulted in the development of dystrophic changes in the liver and kidneys. It is suggested that the maximum permissible MDTE concentration in the air of industrial premises be set at 0.05 mg/liter.

A67-80196
MAGNITUDE ESTIMATION OF ANGULAR VELOCITY DURING PASSIVE ROTATION.

James H. Brown (U.S. Army Med. Res. Lab., Fort Knox, Ky.).
Journal of Experimental Psychology, vol. 72, Aug. 1966, p. 169-172. 7 refs.

Using an adaptation of the Stevens' scaling technique, 25 subjects estimated subjective angular velocity during constant angular acceleration in darkness. Acceleration intensities varied from 3"/sec.² to 24"/sec.², with stimulus durations ranging from 10 sec. to 80 sec. The exponent of the power function relating the subjective and intensive dimensions is on the order of 1.0.

A67-80197
ON LEARNING SEVERAL SIMULTANEOUS PROBABILITY-LEARNING PROBLEMS.

James R. Erickson (Ohio State U., Columbus).
Journal of Experimental Psychology, vol. 72, Aug. 1966, p. 182-189. 16 refs.
 Contract AF 33(657)-11718.

Subjects performed four simultaneous probability-learning tasks under either speed or accuracy instructions. When the four π values were the same, they tended to overshoot matching under accuracy instructions, but under speed instructions

overshot only the higher π values. When the four π values were not the same, there was a tendency to overshoot for lower π values, but not higher ones. Subjects consistently responded faster at higher π values and the increase in speed was linear as π increased from .50 to 1.00. Subjects' subjective estimates of π suggested that they rather consistently overshoot their π estimates by 5-10 percentage points (except when $\pi = 1.00$). These results were discussed with respect to stimulus-sampling theories of probability learning

A67-80198
SHAPE PERCEPTION FOR ROUND AND ELLIPTICALLY SHAPED TEST OBJECTS.

H. W. Leibowitz and Kathleen A. Meneghini (Pa. State U., University Park).

Journal of Experimental Psychology, vol. 72, Aug. 1966, p. 244-249. 14 refs.

Grants NIH MH-08061 and NSF GE-1507.

In order to determine whether the phenomenon of shape constancy as observed with circular test objects is influenced by a tendency to respond in terms of a familiar circular shape, matches were obtained for a round and two elliptically shaped test objects. With this procedure, shape constancy for a round test object is manifested by matches which are rounder than the retinal image. The data, obtained in two experiments involving variation of angle of rotation and exposure duration indicate that the constancy phenomenon is toward the true shape of the test object and that circularity is not a factor. These results emphasize the importance of cues, present during observation, as mediators of shape constancy.

A67-80199
TRANSFER OF VERBAL DISCRIMINATIONS BASED ON DIFFERENTIAL REWARD MAGNITUDES.

N. K. Estes (Stanford U., Calif.).

Journal of Experimental Psychology, vol. 72, Aug. 1966, p. 276-283. 5 refs. ONR supported research.

A group of 40 human subjects was first given training in a modified verbal discrimination situation in which the two stimuli in each pair had different associated reward values, then was tested on various new combinations of the training stimuli. On the basis of a final series of single-stimulus tests, gradients were constructed for the distributions of probabilities that subjects would tend to predict each of the possible reward values upon presentation of each of the stimuli singly. These gradients, together with a scanning model for choice responding, generated relatively accurate predictions of the proportions of choices to test combinations. A comparison of these data with those from a similar experiment conducted with monkeys by Meyer, LoPopolo, and Singh (1966) tends to support a common interpretation of the operation of reward.

A67-80200
PERCEIVED DEPTH AS A FUNCTION OF RELATIVE HEIGHT UNDER THREE BACKGROUND CONDITIONS.

William Epstein (Kan. U., Lawrence).

Journal of Experimental Psychology, vol. 72, Sep. 1966, p. 335-338.

Grant NIMH MH 4153.

The hypothesis was proposed, that the perceived depth, which results from the relative height cue, depends on "optical adjacency." A 3X3 factorial experiment was conducted to examine this hypothesis. The two factors were vertical separation (3.5, 5.5, 7.5 in.) in background conditions (0 background, outline background without surface texture, textured background). Verbal estimates of the depth between pairs of frontal

parallel points were obtained under the nine conditions. In one experiment, the backgrounds simulated a floor surface, and in another, the backgrounds simulated a ceiling surface. The results in both experiments were comparable. Both main effects, separation and background, and the interaction effect were significant. All the effects were in the direction predicted by the optical adjacency hypothesis.

A67-80201
SEARCH-DISCRIMINATION TIME AND THE APPLICABILITY OF INFORMATION THEORY.

Arie M. Oostlander and Hans de Swart (Free U., Lab. for Exptl. Psychol., Amsterdam, The Netherlands).

Journal of Experimental Psychology, vol. 72, Sep. 1966, p. 423-428. 9 refs.

Some objections against the application of information theory with regard to discrimination tasks are refuted by means of comments on and a replication of an experiment by Thomas and Solley (1963). In search-discrimination experiments information theory does not "predict" a logarithmic relationship between RT and stimulus uncertainty because of the instability of the rate of gain of information, as already pointed out by Hick (1952). Besides the influences of amount of uncertainty, amount of redundancy and form of the constraint in the stimulus field were considered. The results of our corrected replication turned out to be wholly congruent with expectations based on information theoretical research.

A67-80202
MEDIATION AND INTERFERENCE IN VERBAL CHAINING.

James G. Martin and George L. Parrott (Chico State Coll., Calif.).

Journal of Experimental Psychology, vol. 72, Sep. 1966, p. 439-442. 7 refs.

Grant NIH MH 10400.

Mediated learning was studied in the A-B, B-C, C-D, A-D paradigm using a modified short-term memory technique. Pairs were arranged into 24 blocks. Within each block, each of the four stages of the paradigm appeared successively. Each stage was a three-pair list presented for study trials followed by a test trial. One or two of the pairs in a stage were part of a mediated sequence, the remainder were part of a control sequence A-X, B-C, C-D, A-D. Each block was completed in less than two min. The dependent variable was the proportion of test pairs (A-D) correct given the previous three pairs in a sequence were correct. The difference between conditional proportions significantly favored mediated sequences.

A67-80203
REMINISCENCE AS A FUNCTION OF PERCEPTUAL SEARCH.

Aubrey J. Yates and Roderick P. McDonald (New England U., Armidale, Australia).

Australian Journal of Psychology, vol. 18, Aug. 1966, p. 137-143. 20 refs.

The Tsai-Partington numbers test was presented in two forms. In one condition (Repeated Pages) the same pattern of numbers was presented on every trial, but in the other condition (Different Pages) the pattern of numbers changed randomly on every trial. Within each condition, an experimental group was allowed a rest of five minutes after 15 trials, before proceeding to trials 16-25; a control group was given all 25 trials without rest. The hypothesis under test was that reminiscence in a psychomotor task is a function of the amount of perceptual search required. The results supported the hypothesis; the Different Page group showed significantly more

reminiscence than the Repeated Page group. The results were not in agreement with predictions derived from either a peripheral work-induced theory of inhibition or a stimulus satiation theory.

A67-80204**A NOTE ON THE EFFECT OF INSTRUCTIONS ON SIZE JUDGMENTS WITH THE TUNNEL ILLUSION.**

A. A. Landauer (Western Australia U., Perth).

Australian Journal of Psychology, vol. 18, Aug. 1966, p. 144-147.

An experiment using three groups of ten subjects showed that "apparent" instructions yield different size judgments of one upright pillar in the tunnel illusion than either objective or projective instructions. Since the mean judgment under apparent instructions is significantly larger than under objective or projective instructions, the mean apparent judgment cannot be the result of some artifactual confusion between the two other types of judgments.

A67-80205**SHORT-TERM MEMORY FACTOR IN THE DESIGN OF DATA-ENTRY KEYBOARDS: AN INTERFACE BETWEEN SHORT-TERM MEMORY AND S-R COMPATIBILITY.**

R. Conrad (Med. Res. Council, Appl. Psychol. Res. Unit, Cambridge, Great Britain).

Journal of Applied Psychology, vol. 50, Oct. 1966, p. 353-356. 10 refs.

An experiment on immediate recall of 8-digit sequence was carried out. Mode of recall was via a data-entry keyboard. Two keyboard layouts were used: 1 of high, 1 of low compatibility. The low-compatibility keyboard required more time for entry and gave more errors. These extra errors were identified as being primarily memory rather than aiming errors. The results are discussed in terms of an interface between short-term memory and S-R compatibility, they are held to support a memory model involving a limited-capacity channel, and a practical design conclusion is suggested.

A67-80206**SHIVERING AND HEAT PRODUCTION IN MEN EXPOSED TO INTENSE COLD.**

Nathaniel Glickman, H. H. Mitchell, Robert W. Keeton, and Edward H. Lambert (Ill. U., Dept. of Med., Chicago and Div. of Animal Nutr., Urbana, Ill.).

Journal of Applied Physiology, vol. 22, Jan. 1967, p. 1-8. 33 refs.

Heat production and integrated electrical activity of skeletal muscles related to shivering and muscle tenseness were simultaneously observed in ten experiments on nine healthy, clothed male subjects seated in a cold room (28.9°C) for four hr. The integrated electrical activity and heat production generally increased with time, reached a peak 2.25-3 hr. after entrance, and then fluctuated. Heat production and electrical activity, heat production and expired air volume, and electrical activity and expired air volume had high coefficients of correlation, +0.875, +0.912, and +0.802, respectively, for 142 paired variates. There was no evidence of increased heat production without an increase in muscle tenseness and/or shivering. Heat production during the first, second, third and fourth hr. averaged 54, 72, 92, and 96 kcal/m², per hr., respectively. Respiratory quotient declined slightly during the exposure. Mean rectal temperature declined during the second and third hr., but was relatively unchanged during the fourth hr. The psychogenic factor was noted during the final 15 min. of exposure, i.e., the ability to cease shivering, and in some cases to become relaxed, when the suggestion to relax was given. Accompanying this cessation of shivering was a corresponding drop in heat production.

A67-80207**ACCLIMATIZATION OF HIGH TRAINED MEN TO WORK IN SEVERE HEAT.**

R. W. Piwonka and Sid Robinson (Ind. U., Dept. of Anat. and Physiol., Bloomington).

Journal of Applied Physiology, vol. 22, Jan. 1967, p. 9-12. 16 refs.

NASA Grant NSG T-15 and Contract DA 49-193-MD 2449.

In a study conducted in April 1963, five highly trained distance runners appeared to be well acclimatized to work (240 kcal. m² per hr.) in the heat (40°C DB, 23.5°C WB) even though none of them had been exposed to heat since the preceding summer. Four of the men continued their training program, and during April of the following year an attempt was made to acclimatize them further by daily performances of the same work in a more intense heat stress (50°C DB, 28°C WB). They wore shoes, socks, and 8-oz. cotton twill suits. All of them experienced marked elevations of body temperature and heart rate in the first exposures followed by significant improvements in heat tolerance in the succeeding days. Their principal adjustments with acclimatization involved a greatly increased cutaneous blood flow and a higher sweat rate per degree rise of rectal temperature. The intensive training program of the runners completely conditioned them for work in moderate heat, and it apparently improved their capacities for acclimatization to a severe heat stress.

A67-80208**CARDIOVASCULAR EFFECTS OF ACCLIMATIZATION TO HEAT AND COLD IN CHICKENS.**

Paul D. Sturkie (Rutgers U., Dept. of Animal Sci., Div. of Physiol., New Brunswick, N. J.).

Journal of Applied Physiology, vol. 22, Jan. 1967, p. 13-15. 10 refs.

Grants PHS H-4279.

Adult chickens were exposed from one to four weeks to high temperatures (32°C, 12 hr., 24-25°C, 11-12 hr.), and to intermediate or control temperatures (23-25°C) for four weeks or more, and to low temperatures (0-2°C, 12 hr., 10-12°C, 12 hr.). Prolonged exposure to intermittent low temperatures up to six weeks did not significantly affect cardiac output and total peripheral resistance but increased feed consumption and decreased body weight, when compared to birds exposed to control temperatures. Prolonged exposure to intermittent high temperatures caused a significant decrease in cardiac output and usually an increase in peripheral resistance within three-four weeks after exposure. The heat-treated birds ate less feed than the control birds, but otherwise there were no other differences. None of the temperature treatments influenced hematocrit, PO₂, and pH of the blood or body temperature.

A67-80209**SYMPATHIC-ADRENOMEDULLARY ACTIVITY IN DOGS DURING ACUTE HEAT EXPOSURE.**

Vincent Fiorica, P. F. Iampietro, E. A. Higgins, and Russell Moses (FAA, Civil Aeromed. Inst., Office of Aviation Med., Physiol. Lab., Oklahoma City, Okla.).

Journal of Applied Physiology, vol. 22, Jan. 1967, p. 16-20. 16 refs.

The present study tests the response of the sympathetic adrenomedullary (SAM) system to a metabolic stress when a respiratory alkalosis is simultaneously induced. Thirty dogs, in groups of five, were exposed to 21.1, 37.8, 40.6, 43.4, 46.1, and 48.9°C (70, 100, 105, 110, 115, and 120°F). Relative humidity at each condition was maintained at 50%. Continuous measurements of respiratory rate (f) and rectal temperature (T_r) were made. Arterial blood samples, taken at regular intervals during heat exposure, were analyzed for

pH, PCO_2 and total catecholamines. Characteristics responses of T_r and f were obtained. A stable thermal equilibrium was achieved only in dogs exposed to heat conditions of 37.8 and 40.6°C. All dogs, however evidenced polypnea (panting) and a respiratory alkalosis. At the end of the exposure period, pH was elevated above 7.60 in all dogs and PCO_2 depressed below 15 mm. Hg. Plasma catecholamine levels were uninfluenced by these conditions, and control levels were maintained within $\pm 0.2 \mu\text{g/liter}$. These data suggest that the activity of the SAM system may be pH dependent and that the response of the system to exogenous stimuli may be modulated by the acid-base characteristics of blood at that time.

A67-80210

RATE OF LOSS OF ACCLIMATIZATION IN SUMMER AND WINTER.

C. G. Williams, C. H. Wyndham, and J. F. Morrison (Transvaal and Orange Free State Chamber of Mines, Human Sci. Lab., Johannesburg, South Africa).

Journal of Applied Physiology, vol. 22, Jan. 1967, p. 21-26. 12 refs.

The rate of loss of acclimatization to heat when men are withdrawn from work in hot conditions in a mine to work in cool conditions for periods of one, two, and three weeks, both in summer and winter, is examined. Samples of 20 men who had been working in a hot area of a mine were withdrawn and subjected to a four-day period of acclimatization. This had the effect of bringing all the subjects to the same state of acclimatization. There was a progressive rise in rectal temperature and heart rate and fall in sweat rate in the groups exposed to four hr. of moderate work at 90°F. WB after being in cool conditions for one, two, and three weeks. There was no significant difference between summer and winter values. The values for these physiological measurements in a control group of unacclimatized men were significantly higher in winter than in summer. The practical implication of these results is that men who have been away from work in hot conditions for one week should be reacclimatized for one day before going back to work in hot conditions.

A67-80211

EFFECT OF ACCLIMATIZATION ON THE SWEAT RATE/RECTAL TEMPERATURE RELATIONSHIP.

C. H. Wyndham (Transvaal and Orange Free State Chamber of Mines, Human Sci. Lab., Johannesburg, South Africa). *Journal of Applied Physiology*, vol. 22, Jan. 1967, p. 27-30. 8 refs.

A sample of 13 acclimatized Bantu males and a fresh sample of between six and ten unacclimatized Bantu at each heat stress condition (making a total of 353 unacclimatized Bantu) were exposed to 45 different combinations of air temperature (with the air saturated with water vapor), wind velocity, and work rate. A table was constructed of the mean sweat rate for 0.3 F class intervals of rectal temperature. The mean sweat rates were based on different sample sizes in the various class intervals of rectal temperature. An exponential equation was used to express the relationship, and the curves so derived fitted the data well. Comparison of the curve for the acclimatized and unacclimatized men showed that they were significantly different (at the 5% level) and that in the acclimatized man: (1) the origin of the steep part of the curve is shifted by over 1°F. to the left; (2) the steepness of the slope of the curve is increased; and (3) the asymptote, or maximum value, of sweat rate is higher. From these results it can be concluded that there is an increase in "sensitivity" and an increase in "capacity" of the regulation of sweat rate by the temperature of the hypothalamus (as represented by the rectal temperature).

A67-80212

EXPERIMENTAL DETERMINATION OF COEFFICIENT OF HEAT EXCHANGES BY CONVECTION OF HUMAN BODY.

Jean Colin and Yvon Houndas (Flight Test Center, Aerospace Med. Lab., Bretigny-sur-Orge, Seine-et-Oise, France).

Journal of Applied Physiology, vol. 22, Jan. 1967, p. 31-38. 16 refs.

The heat exchanges by convection were measured in 69 experiments on 15 subjects for various ambient conditions. First, experiments where skin and wall temperatures were equal allowed the direct measurement of the heat lost by convection. Comparison of the data obtained in these conditions with those obtained with equal wall and air temperatures permitted calculation of the effective radiation area. Then the amount of heat exchanged by convection was computed from the heat lost by evaporation; the metabolic production of heat was measured at the end of exposure in the climatic chamber and the heat exchanges by radiation were computed by the law of Stefan-Boltzmann and with the aid of the effective area for radiation calculated above. From experimental results the following equation for heat exchange by convection was obtained: $O_c = (2.3 + 7.5 \cdot V^{0.7}) \cdot (\theta_s - \theta_a)$. This formula, compared with those of other authors, refines their results, especially those of Winslow et al. and demonstrates the role of free convection. It confirms also indirectly the measurements of the coefficient of heat exchanges by evaporation carried out by Clifford et al., showing that the wind acts in an identical manner in both cases.

A67-80213

HEAT ACCLIMATIZATION BY CONTROLLED HYPERTHERMIA IN HOT-DRY AND HOT-WET CLIMATES.

R. H. Fox, R. Goldsmith, I. F. G. Hampton, and T. J. Hunt (Nat. Inst. for Med. Res., London, Great Britain).

Journal of Applied Physiology, vol. 22, Jan. 1967, p. 39-46. 18 refs.

Acclimatization by controlled hyperthermia (38.2°C. for two hr. daily for 12 days) of one group of subjects in hot-dry conditions was compared with the same exposure of a second group in hot-wet conditions. Compared in the same standard tests both groups initially responded equally and after acclimatization both had developed marked and similar improvements in response. However, arm sweat measurements showed that there was a difference in the effects of the two climates on the sweat suppression phenomenon. Arms that had been exposed to hot-wet conditions throughout acclimatization developed a reduced rate of sweat suppression not seen in the arms exposed throughout to hot-dry conditions. This difference between acclimatization in hot-wet and hot-dry conditions could be important in determining the subjects' subsequent tolerance to heat, especially when the exposure is prolonged and the conditions are humid. It is suggested that when sweat rate is used as an index of acclimatization both the maximum sweating capacity for a given increase in body temperature and the rate of sweat suppression need to be measured.

A67-80214

COLD EXPOSURE OF FARM AND LABORATORY WORKERS.

R. Goldsmith (Nat. Inst. for Med. Res., Div. of Human Physiol., London, Great Britain).

Journal of Applied Physiology, vol. 22, Jan. 1967, p. 47-49. 6 refs.

The time that two groups, one of farm workers, the other of laboratory workers, were exposed to below 5 and 10°C. was measured during one week in winter in England. The time spent outdoors and in bed were also elicited. Further, the

clothes the men wore and the degree of comfort they maintained were recorded. The two groups differed considerably; the farm workers spent nearly 23% of the 24 hr. outdoors, 10% below 5°C and 44% below 10°C., while the laboratory workers were outdoors for only 4% of the 24 hr., 0.6% below 5°C and nearly 10% below 10°C. Farm workers slept a considerably shorter time (7.2 hr./night in contrast to 8.7 hr. for the laboratory workers). The number of layers of clothing worn by the two groups was similar in spite of the differences in exposure to cold. It is suggested that farm workers would be good subjects for cold acclimatization studies and that their relatively light clothing suggests a decreased sensitivity to cold.

A67-80215**METABOLIC STRESS OF ENDURANCE SWIMMING IN THE LABORATORY RAT.**

William D. McArdle (N. Y. City U., Queens Coll., Dept. of Health and Phys. Educ., Flushing).

Journal of Applied Physiology, vol. 22, Jan. 1967, p. 50-54, 29 refs.

By means of closed-circuit spirometry the oxygen consumption of 17 trained, male albino rats was determined under conditions of rest and swimming with no weight and with loads equivalent to 0.5, 1.0, and 2.0% of the body weight attached to the tail. Upon completion of the exercise, recovery metabolism was recorded for 25 min. It was concluded: (1) The exercise oxygen consumption of nonweighted animals averaged 2.7 times the resting level. In animals able to swim without apparent difficulty, this increased with the addition of weight to 3.5-fold at a load equivalent to 2.0% body weight. (2) With the addition of weight many animals had difficulty swimming at the surface of the water. This difficulty was reflected in a decreased aerobic metabolism which actually was less than the average of the nonweighted trials. (3) The oxygen consumption in milliliters per kilogram per minute at rest and at all levels of exercise was negatively correlated with body weight. (4) The rate of recovery was dependent upon the preceding exercise stress; i.e., the heavier the weight attached during swimming, the slower the recovery.

A67-80216**PHYSICAL PERFORMANCE OF WOMEN FOLLOWING HEAT-EXERCISE HYPOHYDRATION.**

J. E. Greenleaf, Elizabeth M. Prange, and E. G. Averkin (NASA, Ames Res. Center, Biotechnol. Div., Moffett Field and San Jose State Coll., Dept. of Phys. Educ. for Women, Calif.).

Journal of Applied Physiology, vol. 22, Jan. 1967, p. 55-60, 37 refs.

Twelve healthy women, ages 22 to 33, underwent a five-month physical training period before being divided into two groups, a control group and a hypohydrated (water-depleted) group. Hypohydration was achieved with the subjects alternately resting and walking (4.8 km./hr.) at 49°C. until they lost about 3.3% of their body weight. They were then given various physical performance tests to assess the effect of the hypohydration. Statistically significant changes ($P < 0.05$) in the hypohydrated group were observed in (a) resting pulse rates, (b) recovery pulse rates following a modified Harvard step test, and (c) the pulse rates and systolic and diastolic blood pressures during a standard 70° tilt table test. No significant decrements were noted in submaximal O_2 intakes, submaximal ventilatory exchange ratio (VE), total body reaction times, and maximal isometric muscular strength. The submaximal V_e was unchanged. It was concluded that there was some deterioration in the cardiovascular system response but there was no gross deterioration in physical performance following 3.3% of hypohydration in fit, young women.

A67-80217**HEMODYNAMIC RESPONSE TO WORK WITH DIFFERENT MUSCLE GROUPS, SITTING AND SUPINE.**

Jesper Stenberg, Per-Olof Astrand, Bjorn Ekblom, Joseph Royce, and Bengt Saltin (Kungliga Gymnastiska Centralinst., Dept. of Physiol., Stockholm, Sweden).

Journal of Applied Physiology, vol. 22, Jan. 1967, p. 61-70, 15 refs.

Swed. Natl. Assn. against Heart and Chest Diseases and Swed. Sports Federation supported research.

Submaximal and maximal work was performed on bicycle ergometers with arms, with legs, and with arms and legs, in sitting and supine position, respectively. Six male and four female healthy and well-trained subjects were studied. During maximal exercise with arms, maximal VO_2 and cardiac output (dye-dilution technique) were 66 and 80%, respectively, of the values attained in sitting maximal leg work. Simultaneous work with arms and legs did not allow higher VO_2 or O_2 than maximal work with legs in sitting position. At a given submaximal VO_2 , heart rate, intra-arterial blood pressure, and pulmonary ventilation were the same in leg exercise as in combined work, but the values were significantly higher during arm work. Stroke volume (in both positions) was higher during exercise than while resting; the lowest exercise values were registered during arm work in sitting position and the highest during combined work, supine position. Calculated total peripheral resistance was higher during arm work compared with other types of work at corresponding levels of oxygen uptake.

A67-80218**INTERACTION OF PHYSIOLOGICAL MECHANISMS DURING EXERCISE.**

Karlman Wasserman, Antonius L. Van Kessel, and George G. Burton (Stanford U., School of Med., Dept. of Med., Respirat. Function Lab., Palo Alto, Calif.).

Journal of Applied Physiology, vol. 22, Jan. 1967, p. 71-85, 45 refs.

Grant PHS HE 06591.

The effects of work intensity and duration on the metabolic, circulatory and ventilatory response to exercise are quantitated in healthy male subjects during cycle ergometer exercise. There is a well-ordered relationship between work rate and oxidative energy sources. Steady-state time for O_2 consumption (VO_2) is dependent on work intensity (the time arterial blood lactate concentration stops increasing). At moderate work, anaerobic metabolism is a very small part of credit oxidation, while at very heavy work, the pyruvate lactate mechanism is the major creditor. The increase in gas exchange ratio (R) reflecting the production of CO_2 from bicarbonate (buffering of lactic acid) is transient. After the steady state is reached, R decreases. The heart rate increase during constant-load exercise parallels the increase in VO_2 . Physiological dead space/tidal volume ratio decreases from 33 to .17 during exercise. The reduction is independent of work duration and only slightly reduced as work intensity increases. Arterial O_2 tension does not decrease during exercise at sea level even at maximal rates of O_2 transport. Arterial-end tidal CO_2 tension of approximately 8 mm. Hg during the respiratory cycle of the exercising subject. Changes in minute ventilation are best predicted from the rate of CO_2 production and the extent of respiratory compensation for metabolic acidosis.

A67-80219**DIFFERENTIAL PULMONARY DIFFUSION CAPACITY IN NORMAL DOGS.**

Elinor M. Glauser (Temple U., School of Med., Dept. of Pharmacol., Philadelphia, Pa.)

Journal of Applied Physiology, vol. 22, Jan. 1967, p. 109-112. 17 refs.

Grant NIH HE-08752.

The diffusion capacity for carbon monoxide (DCO) was measured for the right and left lungs of eight healthy, adult, male dogs. These determinations were made simultaneously by the single-breath technique of Ogilvie using a Rahn modification of the Lategola-Wright tracheal divider connected to a Gaensler Collins recording bronchspirometer. The lung volumes were determined and the left lung volume was 47.2% and the right lung volume was 53.8% of the total. Statistical analysis of the D_{CO} for the right and left lung showed significant difference between the two sides. The total D_{CO} was calculated as the sum of the right and left lungs, the left lung contributed 44% to the D_{CO} and the right lung 56%.

A67-80220

EFFECT OF CHANGES IN PA_{CO_2} AND PA_{O_2} ON CARDIAC PERFORMANCE IN CONSCIOUS DOGS.

M. I. M. Noble, D. Trenchard, and A. Guz (Fulham Hosp., Charing Cross Hosp. Med. School, Dept. of Med., London, Great Britain).

Journal of Applied Physiology, vol. 22, Jan. 1967, p. 147. Grant NIH HE 06851 and British Heart Found. supported research.

Carbon dioxide, oxygen, and nitrogen mixed with room air were administered to conscious dogs. Aortic flow and acceleration and left ventricular stroke volume were measured by an electromagnetic flowmeter with a chronically implanted transducer on the ascending aorta. Pressures were measured through implanted catheters in the left atrium or ventricle, pulmonary artery, right atrium or ventricle, and aorta. The effects were related to the changes in arterial PCO_2 , PO_2 , and pH. Carbon dioxide was a powerful myocardial depressant; increases of Pa_{CO_2} as small as 3 mm. Hg produced reductions of maximum acceleration. Small changes in arterial pH produced by acid infusion did not affect cardiac performance. Changes in Pa_{O_2} over the range 40-500 mm. Hg had no effect on cardiac performance.

A67-80221

ADAPTATION OF THE BODY TO TEMPERATURE FLUCTUATIONS [K VOPROSU OB ADAPTATSII ORGANIZMA K TEMPERATURNYM KOLEBANIIM].

G. Kh. Shakhbazian and F. M. Shleifman (Kiev Sci.-Res. Inst. of Hyg. Labor and Prof. Diseases, UkrSSR).

Vestnik Akademii Meditsinskikh Nauk SSSR, no. 8, 1966, p. 8-12. 27 refs. In Russian.

White rats and rabbits were subjected to sudden intermittent changes of air temperature from 40 to 5°C. and back four times within three hours. Several groups of animals were kept under this regimen for one month. After a single exposure to higher temperature the animals body temperature rose by 0.8-1.7°C. When the air temperature was dropped to 5°C. the body temperature became normal or even subnormal. When the experiments lasted four weeks no adaptation was noted, that is the body temperature rise was not less after exposure to higher air temperature. The body temperature drop after the exposure to low temperatures did not decrease. After the animals were subjected to the temperature change for a long period of time the biochemical tests showed subnormal values for blood proteins, amino acid nitrogen and liver proteins, blood sugar and alkaline reserves. The changes persisted for several weeks. The effect could be considered as pathological because of persistent histological deviation from normal.

A67-80222

IMPORTANCE OF SPECTRAL ANALYSIS IN ASSESSING FEATURES SPECIFIC TO THE EFFECTS OF LOCAL VIBRATIONS ON THE HUMAN ORGANISM [ZNACHENIE SPEKTRAL'NOGO ANALIZA DLIA OTSENKI OSOBNOSTEI VOZDEISTVIA NA ORGANIZM CHELOVEKA LOKAL'NYKH VIBRATSII].

I. K. Razumov, N. N. Malinskaia, E. I. Denisov (USSR, Acad. of Med. Sci., Inst. of Hyg. Labor and Prof. Diseases, Moscow). *Vestnik Akademii Meditsinskikh Nauk SSSR*, no. 8, 1966, p. 13-17. In Russian.

In order to establish the undesirable effects produced by power-tool vibrations on human health, it was necessary to analyze the spectrum of vibration in each case. The tools in question were the hammer type or rotary type which were found to produce about 700 different spectra of vibrations with a wide range of frequencies. However, these spectra varied with the type of work, the material on which the tool is used, and other factors. The character of vibration produced by an individual tool can indicate the potential damage sustained by the user. Examples of vibrations by specific tools are given. Drill workers showed disturbances in the cardiovascular system, while those who used machines for pounding surfaces developed muscular disturbances. Men who used tools of frequencies of about 250 c.p.s. and low amplitude did not suffer any ill effects, but these frequencies combined with high amplitudes proved to be very dangerous and caused a definite vibration sickness. Devices which would eliminate vibrations could reduce vibration ailments.

A67-80223

CHANGES IN THE RESISTANCE OF TISSUES IN ANIMALS INHALING IONIZED AIR [OB IZMENENII REZISTENTNOSTI TKANEI ZHIVOTNYKH PRI DYKHANII IONIZIROVANNYM VOZDUKHOM].

L. V. Serova.

Vestnik Akademii Meditsinskikh Nauk SSSR, no. 8, 1966, p. 39-44. 27 refs. In Russian.

Under normal conditions living organisms are exposed to the weakly ionized air produced by the cosmic radiation. A study was made to determine the effect of ionization on mice and rats inhaling air containing a large number of positive and negative ions of about $2-3 \times 10^5$ ions/ml. The tissue resistance to the damage by physical factors such as ionized air or hypoxia can be determined by the degree of dye absorption by various tissues of vital organs. A decrease in absorption indicated an increase in resistance. A single 24 hr. exposure of the adult mice to the negatively ionized air containing $2-3 \times 10^5$ ions/ml. caused a decrease in the absorption of neutral red, particularly in the liver, diaphragm, and the small intestines. Positive ionization of the same density caused an increased absorption of neutral red. The absorption of phenol red was decreased by positive and negative ions. These changes could be due to physical and chemical changes of the protein molecules. In rats exposed to ionized air the absorption of neutral red was decreased by the positive and negative ions, but the absorption of phenol red was increased by the negative ions, and decreased by the positive ions. The results showed a decrease in dye absorption, except in case of phenol red when the negative ion increase was balanced by the positive ions decrease. It may be said generally that ionized air stimulated an increase in the resistance to physical injury.

A67-80224

EFFECT OF COMBINED ACTION BY DIFFERENT TYPES OF RADIANT ENERGY ON THE ORGANISM RESISTANCE TO IONIZING RADIATION [VLIANIE KOMBINIROVANNOGO DEISTVIA RAZLICHNYKH VIDOV LUCHISTOI ENERGI NA USTOICHIVOST' ORGANIZMA K IONIZIRUIUSHCHEMU IZLUCHENIIU].

N. F. Galanin, R. S. Mostova, T. A. Sviderskaia, and D. M. Triukov (Leningrad Sci. Res. Inst. of Radiation Hyg., USSR). *Vestnik Akademii Meditsinskikh Nauk SSSR*, no. 8, 1966, p. 45-50, 27 refs. In Russian.

The effect of a preliminary exposure of an organism to ultraviolet and infrared radiations on the body's resistance to the ionizing radiation of X-rays was studied in mice, guinea pigs and rabbits. Resistance to diseases, immunity to microbial infections, changes in blood biochemistry, activity of tissue enzymes and the state of the central nervous system were taken as indices of the biological effects. The results showed that a preliminary exposure to the ultraviolet rays increased the body's tolerance to the ionizing radiation within 200-600 r range. Biochemical data indicated a variety of responses in different areas and tissues. The outstanding, positive effect was a reduction of leucopenia. The infrared radiation, however, increased the degree of ionizing radiation damage. It could be concluded that the simultaneous exposure to ultraviolet and infrared radiation may cancel their individual effects.

A67-80225

FACTORS CONTRIBUTING TO THE DELAY IN THE PERCEPTION OF THE OCULOGRAVIC ILLUSION.

Brant Clark and Ashton Graybiel.

American Journal of Psychology, vol. 79, Sep. 1966, p. 377-388, 20 refs.

NASA supported research.

The purpose of this study was to observe the effects of factors which contribute to the delay in the change in the perception of the horizontal following a change in the direction of resultant force acting on an observer (the oculogravic illusion). Five normal and eight labyrinthine defective men were studied in a Slow Rotation Room. Four separate experiments were conducted with changes in direction of resultant force of 20° or 30° acting on the subjects. The results showed very small effects on preexposure-conditions prior to the change in direction of resultant force. On the other hand, delays in the presentation of a luminous target following a change in the resultant force and before settings to the visual horizontal occurred produced major, systematic effects on the perception of the visual horizontal. These results are discussed in terms of the interaction of visual and gravitational cues in producing the lag-effect.

A67-80226

A STUDY OF INFLECTION-POINTS IN THE LOCUS OF ADAPTATION-LEVELS AS A FUNCTION OF ANCHOR-STIMULI.

Harry Helson and Henry G. Masters (Kan. State U., Manhattan). *American Journal of Psychology*, vol. 79, Sep. 1966, p. 400-408, 12 refs.

Contract Nonr-3634(01).

Inflection-points in the locus of adaptation level (ALs) were studied as a function of anchors varying from 1.56 to 2879 gm. or 1200:1 with series-stimuli of 100, 150, 200, 250, and 300 gm. Due to the fact that series AL is higher with zero anchor than with anchors below the series, including subliminal anchors, it was predicted from the weighted log mean definition that an inflection-point would be found with anchors below the series stimuli, and this deduction was verified experimentally. With anchors above the series stimuli, we expect a levelling off in their effectiveness from the definition of AL, but a slight drop in AL with the heaviest anchor suggests that there may also be an inflection-point at the high end of the stimulus-continuum as well as at the low end. Since larger muscle groups and a new mode of lifting are required with extremely heavy weights, it is not surprising that extremely heavy stimuli are less effective as anchors. The presence of inflection-points in the locus of ALs does not

invalidate the weighted log mean definition; they merely point to the fact that the weighting coefficients for series, background (anchor), and residual stimuli are not constant over the whole stimulus-range. In view of the lability and complexity of receptor, central, and motor systems, it can hardly be expected that any psychophysical parameters will remain fixed over the entire range of stimulus-magnitudes.

A67-80227

CROSS-MODAL JUDGMENTS OF LENGTH.

Robert S. Davidson and James H. Mather (Bryn Mawr Coll., Pa.).

American Journal of Psychology, vol. 79, Sep. 1966, p. 409-418, 11 refs.

Grant AFOSR 63-11

Judgments of relative apparent length were obtained with different standards in relation to the same series of bars, tactually or visually perceived. The modality of the standard and series, their order, and the method of judgment were varied. As measures of typical ipse- and cross-modal judgment, point of subjective equality (PSEs) and series adaptation level (ALs) were determined independently. It was found that visual judgments of length and those with active touch were comparable, that the cross-modal PSE varied with length of the standard approximately as did the ipse modal PSE. The cross-modal PSE did not typically correspond to the neutral point of the series (as asserted by previous investigators), and the significant shifts in PSE occurred with little or no change in series AL. Variability differed, but the similarity of the mean inter- and intra-modal PSE was demonstrated with both absolute and comparative judgments. The interrelation of judgments could not be fully accounted for by a common schema, that is, by a single coordinate scale of reference for judgment of length.

A67-80228

RETINAL ANOXIA AND THE LOCUS OF THE AFTER-EFFECT OF MOTION.

Thomas R. Scott and Dorothy Z. Wood (VA Hosp., Columbia, S. C.).

American Journal of Psychology, vol. 79, Sep. 1966, p. 435-442, 14 refs.

The purpose of this study was to test whether a retinal component exists in visual after-effects of motion. An attempt was made to remove any influence of the stimulated retina by applying pressure to the eye, thereby temporarily interrupting retinal blood supply. The rate of the after effect was measured by having the subject adjust the size of the test-stimulus after viewing a rotating spiral. The results showed that 'transferred' after-effect obtained by stimulating one eye and testing the opposite was significantly less than the monocular after-effect. While pressure-blinding had some significant effects on the after-effect rate under some of the conditions of the experiment, the pattern of these effects was not consistent with the hypothesis of a retinal locus for the process involved in the after-effect of motion. It was concluded that if such retinal processes exist, they can account for only a very small fraction of the after-effect.

A67-80229

GAZE-CONTINGENT ADAPTATION TO PRISMATIC SPECTACLES.

Herbert L. Pick, Jr. (Minn. U., Minneapolis) and John C. Hay (Smith Coll., Northampton, Mass.).

American Journal of Psychology, vol. 79, Sep. 1966, p. 443-450, 5 refs.

Grant NIH MH 07588.

Adaptation to the gaze-contingent distortions produced by wedge-prisms was measured. Attention was focused on the tilting or shearing associated with vertical head-eye movements and the stretching and compression associated with lateral head-eye movements. In the course of 42 days of prism-exposure, small but statistically significant amounts of adaptation were shown for both these distortions by a variety of testing procedures.

A67-80230

ANCHOR-EFFECTS IN PITCH-LOCALIZATION.

Eugene D. Rubin, Mark E. Ware, and Harry Helson (Kan. State U., Manhattan).

American Journal of Psychology, vol. 79, Sep. 1966, p. 459-463. 6 refs.

Contract Nonr 3634(01) and Grant PHS 5TIMH-8359.

Typical anchor effects were found in pitch-localization: an anchor below the series-pitches displaced them upward, and an anchor above the series-pitches displaced them downward with the maximal shifts occurring in series-stimuli nearest the anchors in accordance with the usual anchor-effects. It thus appears that pitch, supposedly a metathetic dimension, yields effects similar to loudness, a prothetic dimension, so far as localization is concerned. While it may be claimed that 'height' is not a metathetic dimension, Christman showed that satiating tones lower in pitch cause an upward displacement in perceived pitch, and higher satiating tones cause a downward displacement in perceived pitch, and higher satiating tones cause a downward displacement in perceived pitch. Whether the anchor-effects found in this study result from apparent position of the anchors relative to that of the series-tones or from their effects on the pitch of the series-tones, or both, can only be answered by further experimentation. It thus appears that no distinction can be made between so-called metathetic and prothetic continua, so far as series- and anchor-effects in perception of pitch and apparent position in space are concerned. Furthermore, series- and anchor-effects appear to be the same with respect to pitch as they are in perception of loudness, brightness, and tactile-kinesthetic qualities.

A67-80231

THE EFFECT OF PRACTICE ON THE SPEED AND ACCURACY OF EQUIDISTANCE-SETTINGS.

Alfred Lit and W. M. Vicars (Southern Ill. U., Carbondale). *American Journal of Psychology*, vol. 79, Sep. 1966, p. 464-469. 5 refs.

Grants NSF G24021 and PHS MH-06621.

Two inexperienced subjects each made about 3,000 settings in a two-rod apparatus designed to test the threshold for binocular depth-perception. The standard rod was located 100 cm. from the observer. The black targets were viewed against an illuminated background. The results were analyzed in terms of both the constant and the variable errors of the settings. Unknown to the subject, the response-time for each setting was also measured. The results show that the magnitude of the constant errors was initially roughly three times the threshold value and negative in direction for both subjects. However, the constant error gradually approached zero with practice but without benefit of knowledge of results. The variable errors were also high for one subject and declined rapidly. They were constant for the other subject. The response-time for each setting rapidly reached a value of 15 sec. The intercorrelations among the response variables are essentially zero for both subjects except, of course, for the expected positive correlation between the median response-time and its variability.

A67-80232

SKIN-CONDUCTANCE AND REACTION-TIME IN A CONTINUOUS AUDITORY MONITORING TASK.

John L. Andreassi (U.S. Naval Training Device Center, Port Washington, N. Y.).

American Journal of Psychology, vol. 79, Sep. 1966, p. 470-474. 7 refs.

Continuous measures of palmar skin-conductance (PSC) were taken as the subject responded to a periodic auditory signals presented against a white noise background. Thirty-two reaction-time (RT) trials were taken for each of 16 subjects over a 40-min. session. The results indicated that subjects had significantly faster RTs on the 10 trials in which PSC was highest as compared to the RTs for the 12 middle and 10 lowest PSC trials. There were decreases in PSC as the experiment progressed. The sharp decrease in PSC between the first and second 10-min. segments of the experiments was accompanied by a significant increase in RT. There was no upturn in RT at the highest levels of PSC and it was suggested that in certain situations the subject's level of arousal must be actively manipulated to achieve an inverted "U" relation between bodily activity level and performance.

A67-80233

TIME-ESTIMATION AT REDUCED BODY-TEMPERATURE.

A. D. Baddeley (Med. Res. Council, Cambridge, Great Britain). *American Journal of Psychology*, vol. 79, Sep. 1966, p. 475-479. 9 refs.

In the first of two experiments 20 Scuba divers were asked to count up to 60 at a one-sec. rate at various times during a week of diving in cold sea water. Rate of counting was found to be correlated significantly and positively with body-temperature, but not with pulse-rate or with order of test. A second experiment tested the hypothesis that this result was due to pre-dive anxiety causing the subject to count more rapidly before a dive. When other divers counted a minute before and after a warm but stressful dive involving the placement of explosives, there was no change in counting rate. It may be concluded that body-temperature affects time-estimation in the manner predicted by Hoagland's chemical-clock hypothesis.

A67-80234

A SIMPLE METHOD FOR PHOTOGRAPHING EYE-MOVEMENTS.

Ira T. Kaplan and William Metlay (N.Y.U., Med. Center, New York City).

American Journal of Psychology, vol. 79, Sep. 1966, p. 488-489.

Grant PHS MH 08164.

A new method is described for photographing eye movements in humans. A mirror is used to reflect light from a slide projector onto the subject's eye. This reflected beam performs the function of providing bright illumination for photography. It also enables the subject to have a constant head position and it marks the changing of the projected display onto the photographic record. A diagram of the setup is shown.

A67-80235

VERBAL MEANING AND PERCEPTUAL STABILITY.

John Paul McKinney (Smith Coll., Northampton, Mass.). *Canadian Journal of Psychology*, vol. 20, Sep. 1966, p. 237-242. 8 refs.

Grant PHS MH 10363-01.

It has been suggested by others that verbal identification is partly responsible for perceptual differences between familiar and unfamiliar material. The present study demonstrates that a visual target is perceptually more stable when recognized

as a familiar letter than the identical material when it is not associated with its verbal label.

A67-80236**ACCURACY AND ORDER OF REPORT IN TACHISTOSCOPIC RECOGNITION.**

M. P. Bryden (Waterloo U., Canada).

Canadian Journal of Psychology, vol. 20, Sep. 1966, p. 262-272. 13 refs.

Grants DRB, Canada 9401-11 and 9401-26.

The effects of exposure duration and spacing between elements on accuracy of recognition and order of report were examined in two tachistoscopic recognition experiments. In both experiments, subjects viewed horizontal rows of eight letters. Variations in exposure time between 20 and 120 msec. had little effect on relative accuracy or on order of report. Report sequences tended to begin further to the left at the longer durations than at the shorter ones. Increasing the spacing between the elements improved the relative accuracy in the more central positions, and resulted in a decrease in the tendency to report the material from left to right.

A67-80237**A PARTIAL LEARNING MODEL OF RECOGNITION MEMORY.**

John A. McNulty (Dalhousie U., Halifax, Canada).

Canadian Journal of Psychology, vol. 79, Sep. 1966, p. 302-315. 12 refs.

Grants NRC, Canada APA- and APT-86.

The first experiment was designed to demonstrate that when the potential effectiveness of associative-type partial learning is similarly restricted, some of the difference between the two methods once again disappears. The second experiment was primarily an attempt to control structural and associative partial learning simultaneously. Subjects were given items of the first order of approximation to English to learn. As well as standard recall tasks, four different recognition tests were used. The first was a standard recognition task in which there was no common structure or association between correct and incorrect alternatives on the recognition test. The second recognition task controlled the potential effectiveness of structural-type partial learning. The third controlled for the potential effectiveness of associative-type partial learning, and on the last recognition test both types of partial learning were controlled simultaneously. Results of the experiment showed that the difference between recall and recognition was about the same when associative-type partial learning was controlled as it was in the standard recognition task. The difference was less when structural-type partial learning was controlled. When the potential effectiveness of both types of partial learning was restricted, there were no significant differences between recognition and recall scores. These results were interpreted as supporting a partial learning model of recognition memory.

A67-80238**EFFECTS OF IMMOBILIZATION: BEHAVIOURAL AND EEG CHANGES.**

John P. Zubek and M. MacNeill (Manitoba U., Canada).

Canadian Journal of Psychology, vol. 20, Sep. 1966, p. 316-336. 36 refs.

Grant NIH MH08748-01 and DRB, Canada supported research.

Two experiments were conducted to determine the effect of restricted motor activity, of a week's duration, on the electrical activity of the brain and on various measures of intellectual and perceptual-motor processes. The results of the first experiment showed a post-immobilization slowing of

occipital electroencephalographic activity, an effect which was significantly different from that of both ambulatory and recumbent control subjects. In addition to this physiological change, a variety of behavioural deficits were found to occur (verbal fluency, recall, space relations, cancellation, reversible figures, and colour discrimination). Some of these were associated with immobilization alone while others appeared to be related to the combined effects of restricted motor activity and the recumbent position. In the second experiment, measures were taken of some of the more complex intellectual and perceptual-motor processes viz., creative and critical thinking, and visual and auditory vigilance. None of the intellectual measures was affected. The results on the two vigilance tasks were unexpected. Performance on visual vigilance was significantly better after the week of immobilization. On the other hand, auditory vigilance was significantly worse in the recumbent subjects relative to the immobilized and ambulatory control subjects. A wide range of unusual subjective phenomena were experienced by the immobilized subjects. Almost all of these, however, could be attributed to the recumbent position. Only the increased incidence of body-image disturbances and of boredom was associated with immobilization alone. These findings indicate that a reduction in the level of kinesthetic and proprioceptive stimulation via immobilization of the body, can produce behavioural and physiological changes similar in many respects to those occurring after prolonged sensory and perceptual deprivation. The differences which occur lie largely in the magnitude of the effects.

A67-80239**TEMPORAL FACTORS IN VISUAL INFORMATION PROCESSING.**

Frank Smith and Peter Carey (Harvard U., Center for Cognitive Studies, Cambridge, Mass.).

Canadian Journal of Psychology, vol. 20, Sep. 1966, p. 337-342. 5 refs.

Twelve subjects were tested on the number of trials required to read tachistoscopically presented rows of six letters into immediate memory. In some conditions the 20-msec stimulus presentation was followed after a brief interval by an interfering 20-msec. presentation designed to disrupt processing of the information available from the original display. In other conditions, re-presentation of the original display after a brief interval permitted more extensive processing of the available information. A continuous presentation of 100, 200, or 400 msec was shown to provide no more useful information than two 20 msec. presentations separated by 60, 160, or 360 msec respectively. The results support a two-stage model of visual information processing, the first involving rapid registration in sensory storage and the second a less rapid transfer into immediate memory.

A67-80240**RELIABILITY OF TEMPORARY THRESHOLD SHIFTS CAUSED BY REPEATED IMPULSE-NOISE EXPOSURES.**

David C. Hodge, R. Bruce McCommons, and Raymond F. Blackmer (U.S. Army Human Eng. Labs., Aberdeen Proving Ground, Md.).

Journal of Auditory Research, vol. 6, Apr. 1966, p. 121-127. 9 refs.

Twenty-two Army enlisted men were given pre- and post-exposure Békésy audiometry at fixed frequencies of 0.5, 1, 2, 3, 4 and 6 kc./sec., nine exposures consisting each of 50 rounds fired from M60 machine gun, 12 rounds/min., with subject's left ear canal exposed to peak SPL of 155 db. The overall fluctuation in mean TTS₂ (interpolated) was 5 db or less for all six test frequencies, and fluctuations in the standard deviations were likewise small. There were no obvious upward

or downward trends in mean TTS_2 across the nine exposures. Individual differences in TTS_2 were quite large, however, and the reliability coefficients in general were small. Repeated-measurement experimental designs were shown to be appropriate for use in impulse-noise studies when the interpretation is based on group mean TTS , and when an adequate number of subjects is used. The most reliable frequencies were two and four kc./sec. The largest numbers of significant inter-frequency co-efficients were between three and four, three and six, and four and six kc./sec. However, the coefficients were too small to be of value in predicting TTS at one frequency from that occurring at another.

A67-80241

RELATION OF HIGH FREQUENCY THRESHOLDS TO AGE AND SEX.

Theodore Zisls (Fort Knox High School, Ky.) and John L. Fletcher (U.S. Army Med Res Lab., Fort Knox, Ky.)

Journal of Auditory Research, vol. 6, Apr. 1966, p. 189-198

The hearing of 20 male and 20 female sixth, ninth, and twelfth grade students for frequencies from 4 to 18 kc./sec. was tested. Left ears were found to be better than right ears, females had better hearing than males, and older subjects tended (although not to a statistically significant degree) to do better than the younger ones. These subjects did not do as well at 15, 16, and 18 kc./sec. as the biological baseline on which the audiometer's "Zero" hearing level was based.

A67-80242

SPEECH AUDIOMETRY AND CLINICAL MASKING.

Frederick N. Martin (New York City U., Brooklyn Coll., Speech and Hearing Center, N. Y.)

Journal of Auditory Research, vol. 6, Apr. 1966, p. 199-203.

In a two-part experiment it was found that high-level masking produces a 5-db modal threshold shift (central masking) in the opposite ear for spondee words, where cross-conduction masking is ruled out. An appropriate correction should thus be made for this factor in clinical practice. A loud masking noise in one ear had no significant effect on discrimination scores unless the presentation level of the PB words was high enough to be perceived by the contra-lateral ear. In such cases the elimination of the better ear from the test by appropriate masking revealed the true (lower) scores. A formula for the use of effective masking in discrimination score testing was proposed.

A67-80243

THE OXYGEN COST OF BREATHING DURING VIGOROUS EXERCISE.

R. J. Shephard (Toronto U., School of Hyg., Dept. of Physiol. Hyg., Canada)

Quarterly Journal of Experimental Physiology and Cognate Medical Sciences, vol. 51, Oct. 1966, p. 336-350. 38 refs. Dept. of Natl. Health and Welfare, Ottawa, Canada supported research.

The oxygen cost of breathing was measured in ten sedentary subjects during treadmill exercise at a known fraction (80 per cent) of their maximal aerobic work capacity. Each subject carried out 16 fifteen-minute treadmill runs over six eight weeks; runs were arranged in a "cross-over" design to minimize learning and training effects. Increments of respiratory minute volume were produced by voluntary hyperventilation throughout four runs. Since airway resistance is influenced by changes in alveolar CO_2 tension, the true oxygen cost of respiratory work during near maximal exercise lies between estimates based on the two techniques of hyperventilation. The estimated oxygen cost for the spontaneously

selected ventilation (average 89 l./min.) was 110 ml. STPD/min. The additional cost of ventilation in excess of 89 l./min. was ≈ 4.4 ml./l. at a controlled frequency of 50 breaths/min. and ≈ 4.3 ml./l. at 100 breaths/min. These values closely matched the possible added intake of oxygen with hyperventilation during maximal exercise; the useful limit of ventilation was ≈ 120 l./min. in these subjects. The efficiency of non-elastic work was in the range of 7-8%.

A67-80244

TRICHLOROETHYLENE: A REVIEW.

G. F. Smith (H. M. Factory Inspectorate, Med. Branch, Bristol, Great Britain).

British Journal of Industrial Medicine, vol. 23, Oct. 1966, p. 249-262. 237 refs.

The acute toxicity of trichloroethylene, manifested preponderantly by central nervous system effects, came to be recognized during the second decade of this century, not long after its introduction as a substitute for benzol as a degreasant in Germany during the First World War. The recognition of a possible chronic toxic effect, characterized by a mild psychorganic syndrome, came much later and is still not universally accepted. Damage to the trigeminal nerve after closed-circuit trichloroethylene anesthesia was observed soon after its introduction as a general anesthetic 30 to 40 years ago, and it was shown to be due to breakdown to dichloroacetylene in carbon dioxide absorbers. The pure substance seems otherwise not to have a specific effect on this nerve. The balance of opinion, based on human observations and on animal experiments, is against a severe toxic effect on the liver, although individual cases of liver damage in industrial workers have been reported. The sudden fatal collapse of young workers during mild exercise has on rare occasions been described, there being in most cases an element of heavy exposure. Investigations on man and animals indicate that pure trichloroethylene has no severe effect on other systems of the body. Maximum permissible levels for trichloroethylene in air were reduced from 400 p.p.m. in 1947 to 200 p.p.m., and in 1961 there was a further reduction to 100 p.p.m., which, except in the Soviet Union, is at present accepted in most parts of the world.

A67-80245

STUDIES IN LEAD POISONING. ORAL THERAPY WITH PENICILLAMINE: RELATIONSHIP BETWEEN LEAD IN BLOOD AND OTHER LABORATORY TESTS.

Stig Selander, Kim Cramér, and Leif Hallberg (Göteborg U., Sahlgrenska Sjukhuset, Med. Services I and II, Sweden). *British Journal of Industrial Medicine*, vol. 23, Oct. 1966, p. 282-291. 37 refs.

Fifteen workers with lead poisoning of varying degrees were treated with penicillamine given by mouth. The effect on symptoms and pathological laboratory values were satisfactory, side effects were generally mild and the drug is considered to be a good alternative to calcium versenate (Ca-EDTA), which must be given intravenously. Previous studies on the reliability of different laboratory tests in evaluating the degree of lead poisoning and the effect of the therapy were extended with special respect to the lead levels in blood. The correlations between lead in blood and lead in urine, coproporphyrins in urine and lead excreted during treatment were of the same order as those found between delta-aminolaevulic acid (ALA) in urine and the same parameters. As could be expected, the correlation between the initial values of lead in blood and ALA in urine was very strong ($P < 0.001$). It also persisted during treatment. It is concluded that penicillamine is efficient and useful in the treatment of lead poisoning. Determinations of lead in blood and ALA in urine are equivalent as expressions of lead poisoning, provided that the lead level in blood is not temporarily raised because of acute exposure.

A67-80246**THE EFFECTS OF SPATIAL JUDGMENTS ON THE PERCEPTUAL AFTEREFFECT RESULTING FROM PRISMATICALLY TRANSFORMED VISION.**

G. Singer (Sydney U., Australia) and R. H. Day (Monash U., Victoria, Australia).

Australian Journal of Psychology, vol. 18, Apr. 1966, p. 63-70.

In two experiments the perceptual after-effect following a period of prismatically transformed vision was investigated. In Exp. 1, using an optical system such that a physically horizontal bar was visually slanted, the effects of active and passive responding and of spatial judgments during the transformation period were studied. Whereas the former variable had no effect the latter significantly affected the size of the perceptual aftereffect. In Exp. 2 the viewed hand was optically displaced by means of a wedge-prism. The significant perceptual aftereffect occurred only when the position of the passive hand was judged during the transformation period. A significant effect did not occur if the hand was merely viewed for the same period.

A67-80247**DIETARY NITROGEN UTILIZATION IN YOUNG MEN FED A DIET IN SOLID AND LIQUID FORM.**

N. S. Scrimshaw, V. R. Young, J. P. Habicht, and B. Cholakov (Mass. Inst. of Tech., Dept. of Nutr. and Food Sci., Cambridge). *American Journal of Clinical Nutrition*, vol. 19, Oct. 1966, p. 227-231. 16 refs.

Grant NIH AM 06274-04.

Six young adult male subjects participated in an experiment designed to determine the effect of diet consistency per se on nitrogen utilization. A diet of conventional foods supplying 1 gm. protein per kg. was fed in solid form for six day adaptation and experimental periods. During the next six day period the same diet was homogenized with water to the consistency of a thick milk shake. For the final six day period the solid diet was again provided. Total water, protein and caloric intake remained constant during the entire experimental period. Urinary nitrogen, creatinine, total urinary volume and specific gravity were measured daily during the periods of liquid and solid diets. Fecal nitrogen excretion was determined on three day pooled samples. There was no measurable effect of the consistency of the diet on the utilization of dietary nitrogen. Psychologic tests made on the subjects during the experimental periods did not detect changes due to consistency of the diet. The results support the use of liquid diets in nitrogen balance experiments in man.

A67-80248**EFFECT OF HYDRAZINE ON LIVER GLYCOGEN, ARTERIAL GLUCOSE, LACTATE, PYRUVATE AND ACID-BASE BALANCE IN THE ANESTHETIZED DOG.**

Sidney R. Fortney (School of Aerospace Med., Physiol. Chem. Sect., Brooks AFB, Tex.).

Journal of Pharmacology and Experimental Therapeutics, vol. 153, Sep. 1966, p. 562-568. 26 refs.

The effects of intravenously injected hydrazine (25-100 mg./kg.) on liver glycogen, arterial glucose, lactate and pyruvate were studied in the anesthetized dog. Immediately following hydrazine there was a transient hyperglycemia, followed by a severe hypoglycemia. The response of glucose was dependent on the initial liver glycogen content. Arterial lactate and pyruvate showed marked elevations after hydrazine. Acidosis with "excess lactate" developed several hours later. The rate of lactate and pyruvate accumulation after hydrazine was proportional to hydrazine dosage up to 50 mg./kg. When hypoglycemia was prevented by glucose infusion, glycogen depletion still occurred and lactate and pyruvate

accumulation was marked. These effects of hydrazine on glucose metabolism are discussed in the light of other known hydrazine-induced metabolic changes.

A67-80249**EFFECTS OF CULTURE CONDITIONS ON HYDROGENASE ACTIVITY OF SCENEDESMUS D₃.**

Hiroshi Sasaki (Kyushu U., Fac. of Sci., Dept. of Biol., Fukuoka, Japan).

Plant and Cell Physiology, vol. 7, Jul. 1966, p. 231-241. 14 refs.

The effects of culture conditions and of culture ages upon hydrogenase activity in *Scenedesmus D₃* were investigated with nitrite and benzoquinone as acceptors. It was noticed that the level of iron in the culture medium played an important part in the development of hydrogenase activity. The cells grown on a medium of relatively high level of iron ($10^{-4}M$) showed higher activity both in nitrite and benzoquinone reduction than those grown on a medium of relatively low level of iron ($10^{-5}M$). In the former case, hydrogenase activity appeared even after a short incubation with hydrogen (30 min.). When the cells with low hydrogenase activity were transferred to a medium containing $10^{-4}M$ iron and the activity was measured every 24 hours, the following facts were observed: (a) Nitrite reduction activity increased markedly during the first 24 hours and then decreased gradually during further cultivation. Furthermore, a parallelism was observed between nitrite reduction activity and cell size. (b) On the other hand, the pattern of change in quinone reduction activity was somewhat different from that of nitrite reduction. This activity appeared only after three days' cultivation, reached a maximum at fourth or fifth day and then decreased. However, the presence of glucose in the culture medium suppressed the appearance of quinone reduction activity, while the nitrite reduction activity was less markedly affected.

A67-80250**BSP RETENTION DURING TOTAL FASTING.**

Maurice Verdy (Hotel-Dieu de Montréal, Sect. d'Endocrinol. et Nutr., Canada).

Metabolism, vol. 15, Sep. 1966, p. 769-772. 6 refs. Conseil des Rech. Méd., Canada (MA-1631).

Twenty-six obese females were fasted for a week in a metabolic ward. The 45 minute bromsulphalein (BSP) retention, which was five per cent before fasting, increased to 14.5 per cent after three days and to 16.9 per cent after seven days of fasting. Cystine, given orally at a dose of 10 gm./day during two days in three cases, failed to correct the abnormal BSP retention. Serum glutamic oxaloacetic and glutamic pyruvic transaminases increased during the first few days in 25% of subjects, but returned to normal on the seventh day. Lactic dehydrogenases were not significantly changed.

A67-80251**DIETARY MODIFICATIONS OF COLD-INDUCED METABOLIC EFFECTS.**

David A. Vaughan, Lucile N. Vaughan, and Harold D. Stull (USAF Arctic Aeromed. Lab., Biochem. Branch, Fort Wainwright, Alaska).

Metabolism, vol. 15, Sep. 1966, p. 781-786. 10 refs.

Cold-exposed male Sprague Dawley rats were forced to obtain their extra caloric requirements from either carbohydrate (sucrose) or fat (Crisco). Rats were killed one, four, and eight weeks after initiation of the feeding regimen. Carcass fat, protein, and moisture analyses were made. Liver glucose-6-phosphatase (G-6-Pase), hexose monophosphatase (HMP) dehydrogenase, and glycogen were assayed. At the end of four and eight weeks the percentages of fat in the carcasses of these rats were significantly higher than in the

cold rats receiving a mixed complete diet ad libitum. The two enzymes studies showed differing responses. HMP dehydrogenase increasing as a result of higher input of carbohydrate in the cold, and G-6-Pase increasing as an apparent result of cold exposure per se.

A67-80252
STUDIES ON THE NATRIURESIS OF FASTING. I. EFFECT OF PREFAST INTAKE.

Bobby J. Stinebaugh and Francis X. Schloeder (Gorgas Hosp., Dept. of Internal Med., Canal Zone, Panama).
Metabolism, vol. 15, Sep. 1966, p. 828-837. 26 refs.
 U.S. ARDC supported research.

By employing low sodium diets in the prefast period, the effects of salt restriction and fasting were temporarily separated so that the character of magnitude of the natriuresis due to the caloric withdrawal could be determined. During fasting, there was a rise in the mean sodium excretion beginning on the second day, reaching a peak on the fourth day, and subsiding thereafter. It is concluded that the natriuresis attributed to fasting in previous studies consisted of two separate but concurrent processes: (1) an early and rapidly diminishing sodium loss due to withdrawal from salt, and (2) a pattern of sodium excretion similar to that described above. The mechanisms and origins of the sodium lost as a result of fasting are considered, and it is suggested that both extracellular and intracellular spaces play varying roles as fasting progresses.

A67-80253
STUDIES ON THE NATRIURESIS OF FASTING. II. RELATIONSHIP TO ACIDOSIS.

Francis X. Schloeder and Bobby J. Stinebaugh (Gorgas Hosp., Dept. of Internal Med., Canal Zone, Panama).
Metabolism, vol. 15, Sep. 1966, p. 838-846. 13 refs.
 U.S. ARDC supported research.

The relationship of acidosis to the natriuresis of fasting was investigated by producing a metabolic acidosis in the prefast period with ammonium chloride. The results show that as a result of this exogenous acidosis, the natriuresis of fasting was considerably reduced. It was concluded that the greatest part of the sodium excretion due to fasting is lost during adaptation to the metabolic acidosis which occurs, and that this can be markedly reduced by adaptation to acidosis in the prefast period.

A67-80254
TERMINAL VELOCITY IMPACTS INTO SNOW.

Richard G. Snyder (FAA, Civil Aeron. Res. Inst., Oklahoma City, Okla.).

Military Medicine, vol. 131, Oct. 1966, p. 1290-1298. 20 refs.

Incidents concerning non-fatal terminal velocity free-falls from great heights into snow are noted, including falls from 18,000 and 23,000 feet without parachutes. Documentation of Soviet airborne jumps from low-slow flying aircraft prior to and during World War II is briefly reviewed. The CARL free-fall files, providing data on approximately 25,000 fatal and survivable free-falls over a two-year period, list only 22 snow impacts in which injury or death occurred. Three of these were from heights of over 1000', and no injury was noted under 40' (50 ft./sec. impact velocity). A detailed case history is presented concerning an impact into snow at terminal velocity resulting from a zero-altitude ejection from an A4E jet fighter, in which impact occurred prior to parachute deployment. The only injuries were a fractured femur, fractured ankles, and upper arm contusions, probably received in striking a tree. Despite initial impact exceeding 180 ft./sec. it was calculated that the time duration of deceleration was .35 seconds and magnitude only 14.4. These cases demonstrate the excellent attenuation properties of snow for impact survival.

A67-80255

THE EFFECT OF SUSTAINED AFFECT ON THE DIURNAL RHYTHM OF ADRENAL CORTICAL ACTIVITY.

George C. Curtis, Max L. Fogel, Donald McEvoy, and Carlos Zarate (Pa. U., Depts. of Psychiat. and Biochem. and Eastern Pa. Psychiat. Inst., Philadelphia).

(*Am. Psychosomat. Soc., 22nd Ann. Meeting, Philadelphia, Pa., May 1 and 2, 1965*).

Psychosomatic Medicine, vol. 28, Sep.-Oct. 1966, p. 696-713. 61 refs.

Grants NIMH MH-08806 and 5-K3-MH-7723.

Interactions between sex, affect intensity, and the circadian rhythm were found to be related to urinary excretion, but not plasma concentrations of 17-hydroxycorticosteroid (17-OHCS). Men excreted more 17-OHCS than women, but the sex difference was concentrated mainly in the morning hours near the peak of the diurnal curve. The increment in 17-OHCS excretion associated with affective distress was concentrated in the "rough" of the curve, during the afternoon and evening hours. It is suggested that the failure of plasma concentrations to reflect these differences could have resulted from the action of a closed loop controller, coupled with differences in cortisol disposal rates similar to those suggested by other workers. Affective distress was also associated with increased between-subject differences in diurnal trend similar to, but less marked than, those observed by other workers in patients with brain damage.

A67-80256

PROBLEM-SOLVING PERFORMANCE IN TWO AGE GROUPS.

Marguerite L. Young (NIH, Natl. Inst. of Mental Health, Lab. of Psychol., Bethesda, Md.).

Journal of Gerontology, vol. 21, Oct. 1966, p. 505-509. 8 refs.

The performance of a group of ten subjects with median age of 67.5 years was contrasted with that of a group of ten subjects with a median age of 33 years on a series of problem-solving tasks. Procedures designed to decrease demands on short-term memory and to impose order in the search for problem solution were introduced with the hope that these aids would improve problem-solving performance of the old subjects. It was found that the performance of the old group was inferior at every level of problem difficulty. The aged subjects performance was characterized by a high degree of redundancy, difficulty in dealing with new concepts as problems became more complicated, and, primarily, an inability to apply a solution strategy which was repeatedly demonstrated.

A67-80257

NUTRIENT INTAKES AND ENERGY EXPENDITURE IN MEN OF DIFFERENT AGES.

Robert M. McGandy, Charles H. Barrows, Jr., Alexandria Spanias, Alla Meredith, Jane Livermore Stone, and Arthur H. Norris (PHS, Bur. of State Serv., Heart Disease Control Program, Washington, D. C.).

Journal of Gerontology, vol. 21, Oct. 1966, p. 581-587. 17 refs.

The daily intakes of calories and various specific nutrients were estimated from the diet records of 252 healthy men between the ages of 20 and 99 for whom socio-economic influences on nutrient availability were minimal. In addition, basal metabolism was measured and energy expended during physical activity was estimated. The results indicated that the nutrient allowances recommended by the National Research Council were met by the majority of subjects in this study. A significant age-dependent decrease was found in total caloric intake which was accounted for by decrements in basal metabolism and in energy expended in physical activity.

A67-80258**THE EFFECTS OF INHALING NON-IONIZED OR POSITIVELY IONIZED AIR CONTAINING 2-4% CO₂ ON THE BLOOD LEVELS OF 5-HYDROXYTRYPTAMINE IN MICE.**

A. P. Krueger (Calif. U., School of Public Health, Berkeley), P. C. Andriese, and S. Kotaka.
International Journal of Biometeorology, vol. 10, Jul. 1966, p. 17-28, 27 refs.

Contracts Nonr 3656(06), (NA102-587), and Grant PHS APO0002-07, Calif. U. supported research.

An animal chamber was constructed which made possible the exposure of small animals for long periods of time to uniform controlled atmospheres containing a given number of cluster ions. Monitoring of the microenvironment was made possible by the fabrication of a miniaturized ion collector. Using these two developments, mice were exposed to non-ionized or to positively ionized air containing either 2% or 4% CO₂. Non-ionized 2% or 4% CO₂ produced a fall in the blood level of 5-hydroxytryptamine (serotonin). Positively ionized 2% or 4% CO₂ elicited a rise in serotonin providing the ionic density was sufficiently great.

A67-80259**SOME EFFECTS OF AIR IONS ON THE ACTIVITY OF RATS.**

C. H. Bachman, P. J. Lorenz (Syracuse U., Phys. Dept., N. Y.), and R. D. McDonald (Veterans Admin. Hosp., Syracuse, N. Y.).
International Journal of Biometeorology, vol. 10, Jul. 1966, p. 39-46, 14 refs.

Grant PHS APO0305-02 and N. Y. State U. supported research.

A duct system was arranged through which flowed air of controlled ion concentration. In series was a chamber with a flexible dielectric floor which made possible electrical detection of activity. Exposure to various ion concentrations of either polarity produced pronounced effects. In addition to gross motor activity six other behavioral parameters were recorded. Among the latter are attacking aluminum foil, urination, sleep, and respiration. The lowest ion concentration were most effective. In addition to presenting a controlled ambient ion concentration the ion current drawn by the animal was measured. This varied markedly from rat to rat.

A67-80260**SEASONAL VARIATIONS IN THE SURVIVAL INDEX OF RATS AT SIMULATED HIGH ALTITUDES.**

B. Bhatia (Defence Inst. of Physiol. and Allied Sci., Madras, India), S. Thomas and S. S. Purkayastha.
International Journal of Biometeorology, vol. 10, Jul. 1966, p. 63-69, 5 refs.

Albino rats were maintained in an animal house, the air temperature of which fluctuated with the variations in the ambient air temperature. Survival index, which is defined as the percentage of rats surviving for 100 min. at a given simulated altitude, was determined for several groups of rats in different months covering a period of about one year. The simulated altitudes used were 25,000, 27,500, 30,000 and 32,500 ft., with an air temperature of 33°C. in winter, and a rise with increase in air temperature during the summer of the succeeding year. In a group of rats removed from an environment at 28°C. to one at 19°C. a significant fall in survival index was observed at the end of four weeks, but not at the end of twelve weeks. It is concluded that exposure to a mild degree of cold reduces the ability of rats to survive hypoxia between 10 and 30 days of cold exposure, which tends to revert to normal between 30 and 90 days.

A67-80261**SOME OBSERVATIONS ON THE EFFECTS OF HEAT, EXERCISE AND HYPOHYDRATION UPON INVOLUNTARY HYPOHYDRATION IN MAN.**

J. E. Greenleaf (NASA Ames Res. Center, Biotechnol. Div., Moffett Field, Calif.).
(Intern. Congr. of Trop. Med. and Malaria, 7th, Rio de Janeiro, Brazil, 1963)

International Journal of Biometeorology, vol. 10, Jul. 1966, p. 71-76, 14 refs.

Four male subjects at a high level of physical fitness were put on a controlled diet four days prior to a four-hr exposure in a hot room (49°C.) in separate experiments at rest or with exercise on a treadmill and free or no access to drinking water. The experiments were repeated at 24°C. Each experiment was followed by a recovery period of eight hr. The water intake during the heat exposure was roughly proportional to the work load. The rate of water consumption during the recovery period was independent of the level of hypohydration. Previously hypohydrated men took longer to regain their water debt than previously hydrated men.

A67-80262**PEAK CHANGES IN ELECTROCARDIOGRAMS OF RATS EXPOSED TO AIR IONS.**

C. H. Bachman, P. J. Lorenz (Syracuse U., Dept. of Phys., N. Y.), and R. D. McDonald (Veterans Admin. Hosp., Psychol. Serv., Syracuse, N. Y.).

International Journal of Biometeorology, vol. 10, Jul. 1966, p. 101-102.

Grant PHS APO0305-02

Electrocardiograms were obtained from rats exposed to air ions both by inhalation and by non-inhalation. Progressive changes were noted in the peak heights of the P, Q, and S waves when ions were inhaled. No such changes were observed when ion exposure was by external surface contact alone.

A67-80263**RADIATION SHIELDING CONSIDERATIONS FOR INTERPLANETARY SPACECRAFT.**

Carl F. Kottler, Jr. (Grumman Aircraft Eng. Corp., Res. Dept., Bethpage, N. Y.).

Journal of the Astronautical Sciences, vol. 13, Jul. Aug. 1966, p. 133-152, 12 refs.

This paper presents an analysis of the radiation dosage astronauts would receive when protected by various combinations of passive shielding, as a function of mission duration and the probability of exceeding the statistically predicted dosage of the NASA Model Solar Proton Environment. Dosages to the internal organs and the skin (taking into account self-shielding) are determined as a function of the energy of the incident particles, and are compared with permissible dosages. The shielding and associated effective cutoff energies required for protection against alpha particles and protons are calculated for mission durations between one week and two years, with three probabilities of exceeding the indicated dosages (0.1, 0.01, and 0.001). The manner of presentation of the data readily permits comparison between magnetic or electrostatic shielding and passive shielding on the basis of radiation dosage and mission duration. Parametric curves for typical aluminum structure, polyethylene shield, hydrogen fueled spacecraft are shown. An introductory description of the solar atmosphere, solar activity, and associated geomagnetic phenomena is also presented.

A67-80264**METEORITES: OPTICAL ACTIVITY IN ORGANIC MATTER.**

W. G. Meinschein (Ind. U., Dept. of Geol., Bloomington), Clifford Frondel (Harvard U., Dept. of Geol. Sci., Cambridge, Mass.), Peter Laur, and Kurt Mislow (Princeton U., Dept. of Chem., N. J.).

Science, vol. 154, Oct 21, 1966, p. 377-380. 18 refs.

NASA Grants NsG 237, NsG 282-63, and Contract NASw-508.

An inner fragment of the Homestead polymict, brecciated, gray, bronzite chondrite (noncarbonaceous) was powdered and subjected to extraction by various organic solvents. The optical rotary dispersion curve corresponded to a low-amplitude, positive, cotton effect, centered about 340 μ . The absence of Tyndall effect of the solution excluded the colloidal particle scattering. Although the exact nature of the substance giving rise to the cotton effect can not be defined, the ancillary evidence indicated this optical activity derived from contamination by the biological matter of the terrestrial origin.

A67-80265

NAVIGATION OF SINGLE HOMING PIGEONS: AIRPLANE OBSERVATIONS BY RADIO TRACKING.

Martin C. Michener and Charles Walcott (Tufts U., Dept. of Biol., Medford, Mass.).

Science, vol. 154, Oct 21, 1966, p. 410-413. 6 refs.

Contracts Nonr 1866(12), 1866(46), and 3225(00); Grant NSF GB 3403

Navigation of homing pigeons was investigated by tracking their homeward flights from a light airplane. Released on successive days from a single training point 35 miles (56 km) from home, individual pigeons, each carrying a transmitter, were repeatedly tracked back to their loft. No two tracks covered the same ground for even short distances, yet all tracks were within ten miles of a straight line. Results from further releases north and south of the training point suggest that pigeons often use three methods in sequence to find home: compass orientation, bi-coordinate navigation, and orientation by familiar landmarks.

A67-80266

DIURNAL VARIATION IN ORGANISMIC RESPONSE TO VERY WEAK GAMMA RADIATION.

Frank A. Brown, Young H. Park, and Joseph R. Zeno (Northwestern U., Dept. of Biol. Sci., Evanston, Ill.).

Nature, vol. 211, Aug. 20, 1966, p. 830-833. 16 refs. ONR, NIH, and NSF supported research.

The hourly spontaneous activity of four white mice was monitored quantitatively throughout a three month period under condition of alternating periods of one and one-half times and about eight times the level of the natural background radiation. A gamma-ray source of 24 μ c. of caesium-137 was used. The activity was monitored under conditions in which the mice were exposed for alternating periods (usually each of 72 hours) to the radiation source: when the position of the source was changed (at about 10 a.m.). Each animal showed its own specific mean 24-hour pattern of activity for the three month period, which was predominantly nocturnal. Experimental animals were found to be less active than controls. Only further experiments can reveal whether the observed 2.7% depression at the higher level of radiation represents a real difference. When mean hourly differences were considered a non-parametric test showed these to differ from random expectation ($P < 0.05$), favoring the side of depression in activity in response to the higher field relative to the lower one at 5 a.m., to 17.6% increase at 9 a.m. The results suggest that the increase or decrease of activity in response to the presence of the higher γ -radiation field depends on the time of day. The apparent daily variation in response to the higher γ -radiation field possesses a pattern resembling the

persistent, basically polyphasic, daily variation in oxygen consumption reported for many organisms. A good correlation appears between the fundamental extrinsically derived, polyphasic 24-hour variation oxygen consumption and the response to very weak γ -radiation field, but results show no comparable relationship between the large circadian variation in activity and the response to radiation, despite the far larger range of overall metabolic variation which is involved.

A67-80267

ROLE OF TEMPORAL PARTS OF THE CEREBRAL CORTEX IN THE DISCRIMINATION OF ACOUSTIC SIGNALS OF DIFFERENT DURATION [O ROLI VISOCHNYKH OTDELOV KORY BOL'SHIKH POLUSHARII V OBNARUZHENII ZVUKOVYKH SIGNALOV RAZLICHNOI DLITEL'NOSTI].

A. V. Baru (USSR, Acad. of Sci., I. P. Pavlov Inst. of Physiol. Lab. of Physiol. of Acoust. Anal., Leningrad).

Zhurnal Vysshei Nervnoi Deiatel'nosti, vol. 16, Jul.-Aug. 1966, p. 655-666. 26 refs. In Russian.

A study was made of the thresholds of discrimination of white noise bursts and of tones of 1000 and 250 c.p.s. as function of their duration. The experiment was made on five dogs before and after the removal of auditory cortex. The motor defensive method was used. In the intact dogs the dependence of the discrimination thresholds on the duration of the stimuli was close to the results of the corresponding psychoacoustic measurements in man. After a unilateral ablation of the auditory cortex, accompanied by a retrograde degeneration of the medial geniculate body, there was a rise in the thresholds for acoustic stimuli shorter than 16 to 10 msec. brought to the ear, contralateral to the side of the removal. A bilateral ablation of the auditory cortex resulted in higher thresholds within the same durations when measured on both ears. The thresholds for longer sounds did not change as compared with their preoperational level, both after the unilateral and the bilateral removal of the auditory cortex. The results of the work point to a special role of the auditory cortex in the analysis of short acoustic signals.

A67-80268

CORRELATION ANALYSIS OF DRIVING RESPONSE IN HUMAN EEG [KORRELIATSIONNYI ANALIZ REAKTSII USVOENIIA RITMA MEL'KANII V ELEKTROENTSEFALOGRAMME CHELOVEKA].

G. N. Boldyeva (USSR, Acad. of Sci., Inst. of Higher Nervous Activity, Moscow and Acad. of Med. Sci., N. N. Burdenko Inst. of Neurosurg., Moscow).

Zhurnal Vysshei Nervnoi Deiatel'nosti, vol. 16, Jul.-Aug. 1966, p. 684-693. 23 refs. In Russian.

Autocorrelation analysis of electroencephalogram (EEG) recorded during rhythmical photostimulation showed periodical components imposed by the flickers' rhythm, and helped to determine their frequency, as well as to characterize quantitatively the degree and stability of the hemispheres. Cross-correlation analysis in EEGs in various cortical areas made it possible to reveal the peculiarities of the functional correction of different brain regions; to determine the degree of connection of the parts of the hemispheres, to define by what rhythms the connection is effected, and to determine the nature of the connection, taking into account the degree of manifestation of the periodic and aperiodic components. Cross-correlation analyses of EEGs and of the rhythm ranges have revealed two types of spatial-temporary relationships of the driving response: (1) irradiation over the cortex of the imposed rhythm from the occipital region to the anterior parts of the hemisphere; this was manifested in an increase in the temporary shift of the maximum of the crosscorrelation function in the occipito-frontal direction; and (2) independent appearance of the driving response in various cortical areas; this was characterized by an earlier appearance of the imposed rhythm in

the fronto-central parts. These peculiarities are due to the different ways of transmission of afferent impulses elicited by photic stimulation to the parts of the hemispheres under investigation.

A67-80269

DIFFERENT EXTINCTION RATE OF THE AROUSAL RESPONSES TO INDIFFERENT SOUNDS IN YOUNG AND OLD RABBITS [RAZLICHIIA V UGASANII REAKTSII AKTIVATSII NA INDIFFERENTNYE ZVUKI U MOLODYKH I STARYKH KROLIKOV].

IU G Kratin (USSR, Acad. of Sci., I. P. Pavlov Inst. of Physiol., Leningrad).

Zhurnal Vysshei Nervnoi Deiatel'nosti, vol. 16, Jul. Aug. 1966, p. 694-698. 20 refs. In Russian.

Two kinds of electroencephalograms (EEG) response to indifferent sounds were recorded: desynchronization and an outburst of the theta-rhythm or its acceleration when the latter was already present. In old rabbits slow EEG activity usually dominated and the responses to repetitive sounds disappeared rapidly. In young animals the background activity was mostly characterized by excitation rhythms and the electrical responses of both kinds were long and steady. They disappeared gradually only after a long period of repetitive stimulation in a long set of experiments. Special attention was given to the response in the form of the acceleration of the theta-rhythm to the acoustic stimulus. A different functional significance of the two kinds of arousal reactions is suggested.

A67-80270

DYNAMICS OF INTEGRATED BIOELECTRICAL CORTICAL ACTIVITY IN SLEEPING MAN [DINAMIKA SUMMARNOI BIOELEKTRICHESKOI AKTIVNOSTI GOLOVNOGO MOZGA U SPIASHCHEGO CHELOVEKA].

A. N. Shepova'nikov (USSR, Acad. of Sci., I. M. Sechenov Inst. of Evolutionary Physiol. and Biochem., Leningrad)

Zhurnal Vysshei Nervnoi Deiatel'nosti, vol. 16, Jul. Aug. 1966, p. 699-706. 31 refs. In Russian.

A study was made of the dynamics of integrated brain activity in young men and women from 13 to 32 years of age during a normal night's sleep. To estimate the depth of sleep according to the electroencephalogram (EEG) in the stages of C, D, and E, it has been suggested to use the ratio of average minute values of the integrated brain activity in the frequency ranges of delta theta (1 to 8 c.p.s.) and alpha beta (8 to 30 c.p.s.) waves. The ratio in the vertex-occipital lead was equal to 1.5 to 2.5 (stage C); 2.5 to 4 (stage D); 4 to 6 (stage E). The ratio may be used for studying the correlation dependence between the depth of sleep according to EEG and different functional parameters. The interdependence between the "paradoxal" stage of sleep and other stages was studied. Some peculiarities were observed of the spontaneous and evoked brain activity at this stage, which separate the "paradoxal" stage from stage B.

A67-80271

PRIMARY RESPONSES OF THE AUDITORY AREA OF THE CORTEX IN RABBITS AS DEPENDENT ON THE INTENSITY OF STIMULATION DURING ONTOGENY [O ZAVISIMOSTI PERVICHNYKH OTVETOV SLUKHOVOI OBLASTI KORY OT INTENSIVNOSTI RAZDRAZHENIIA V ONTOGENEZE U KROLIKA].

M. P. Kliavina and G. A. Obratsova.

Doklady Akademii Nauk SSSR, vol. 169, Aug. 21, 1966, p. 1471-1473. 9 refs. In Russian.

Young rabbits from three days to two years old were used in a study of the functional development of the brain cortex

during various growth periods. Changes in the brain bioelectrical activity reflecting the total sum of all brain-area responses to a stimulus were recorded during the growth of each animal. Auditory center response to a burst of sound was used in this case. The first reaction was noted in animals five to six days old when the intensity of sound equal to the adult threshold, of 70-80 db. was used. The intensity of response increased sharply and the latent period decreased as the animal developed. The maximum response was reached at 16 to 40 days. This period was characterized by a wide irradiation of the stimulus with involvement of the reticular formation which enhanced the brain cortex activity.

A67-80272

CERTAIN PECULIARITIES IN GAS-METABOLISM AND CONDITIONED REFLECTORY ACTIVITY IN ANIMALS UNDER CONDITIONS OF PROLONGED STAY IN A HELIO-OXYGENIC MEDIUM [O NEKOTORYKH OSOBNOSTIAXH GAZOOBMENA I USLOVNOREFLEKTORNOI DEIATEL'NOSTI ZHIVOTNYKH PRI DLITEL'NOM PREBYVANII V GELIO-KISLORODNOI SREDE].

G. V. Troshikhin.

Doklady Akademii Nauk SSSR, vol. 169, Aug. 21, 1966, p. 1480-1482. 9 refs. In Russian.

Mice kept in the atmosphere of 21% oxygen and 79% helium developed certain changes in the body metabolism. Within three days of exposure the oxygen consumption was increased by 50% when the ambient temperature was maintained at 21°-23°C. The body temperature, however, dropped by 0.5°-1.0°C because the helium heat conductivity is six times higher than that of nitrogen and caused a greater heat loss than in normal air. In order to maintain normal body temperature the air temperature must be raised by 2°-4°C. The lowering of body temperature by helium may lead to an increase in basal metabolism. This fact was considered as a reason for a slower development of conditioned reflexes when the animals were kept in the helium-oxygen mixture for two weeks. Upon the return to normal conditions the increase in gas metabolism persisted for two days, before slow normalization began. This indicated a temporary functional change in the physiological processes.

A67-80273

UNIT FOR EXAMINATION OF THE VISUAL PERCEPTION SPEED [USTANOVKA DLIA ISSLEDOVANIIA SKOROSTI ZRITEL'NOGO VOSPRIIATIIA].

N. M. Ovetskaia (Inst. of Work Physiol., Donetsk, USSR).

Gigiena Truda i Professional'nye Zabolevaniia, no. 5, 1966, p. 53-55. In Russian.

A device for recording the visual perception rate is described. Two photographs and a schematic drawing are included. The machine is portable and has a separate instrument panel, which makes it possible for an observer to operate it some distance from the subject. A formula is given for computing the index of visual perception. However, the author suggests a series of tables computed for readily available values.

A67-80274

EVEN-ORDER SUBHARMONICS IN THE PERIPHERAL AUDITORY SYSTEM.

Peter J. Dallos and Craig O. Linnell (Northwestern U., Auditory Res. Lab. and Biomed. Eng. Res. Center, Evanston, Ill.)

Journal of the Acoustical Society of America, vol. 40, Sep. 1966, p. 561-564. 13 refs.

NIH supported research.

It was observed that the conventional one-half frequency undertones primarily occur above 2500 300 Hz. In a series of experiments, these subharmonics were monitored in the sound field in front of the tympanic membrane, while first the cochlea and then the stapes were removed. It was found that the presence of the cochlea or the stapes is not necessary for the generation of even subharmonics. These distortion components are radiated by the nonlinearly vibrating eardrum.

A67-80275

DESCRIPTIVE ANALYSIS OF DOPPLER DISCRIMINATION AS A FUNCTION OF VARIATIONS IN DIMENSIONS OF THE SONAR ECHO.

Alan W. Lau (U.S. Naval Personnel Res. Activity, San Diego, Calif.)

Journal of the Acoustical Society of America, vol. 40, Sep. 1966, p. 565-569. 7 refs.

Subjects were drilled and tested on their ability to judge sonar Doppler. Synthetic sonar echoes were systematically varied with respect to type of Doppler, echo duration, the rate of echo onset, and relative signal strength, and superimposed upon a sea-recorded reverberation pattern. The purposes of the study were to (1) identify the effects that variations in echo length, echo onset, and relative signal strength have upon the ability to discriminate Doppler correctly; and (2) evaluate the effect that training has upon the improvement of Doppler discrimination. Results indicated that performance was significantly affected by echo duration and the relative intensity of the echo, the interactions among the echo dimensions appeared to be largely the result of various perceptual or response biases toward no Doppler echoes.

A67-80276

INTEGRATION OF ACOUSTIC POWER AT THRESHOLD BY NORMAL HEARERS.

Wayne O. Olsen and Raymond Carhart (Northwestern U., Auditory Res. Lab., Evanston, Ill.)

Journal of the Acoustical Society of America, vol. 40, Sep. 1966, p. 591-599. 29 refs.

NIH supported research.

Threshold response for seven durations of 250-, 1000-, and 4000-c.p.s. and white noise were determined for 32 normal-hearing persons. The time parameters and spectral characteristics of the stimuli were carefully specified. The following results were obtained: (1) There was no significant difference between the male or female groups employed here with regard to their threshold response to short-duration acoustic stimuli. (2) The decrease in intensity required for threshold response as a function of stimulus length was a real difference when the stimulus was systematically doubled in length from 10 to 500 msec. (3) Changes in the intensity necessary for threshold response resulting from changes of signal length were highly similar for 250-, 1000-, and 4000-c.p.s. and white-noise stimuli of more than 50 msec. in length, but there was an excessive increase in intensity needed for response when 250-c.p.s. stimuli were made shorter than 50 msec. in duration. (4) Test-retest reliability of threshold response to short-duration acoustic stimuli was excellent. (5) The model proposed by Garner and Miller [J. Exptl. Psychol. 37, 293-303 (1947)] accurately described the mean threshold data obtained in this investigation.

A67-80277

WIDTH OF THE SPECTRUM EFFECTIVE IN THE BINAURAL RELEASE OF MASKING.

Man Mohan Sondhi and Newman Guttman (Bell Telephone Labs., Inc., Murray Hill, N. J.).

(*Fifth Intern. Congr. on Acoust., Proc., Liege, 1965*).

Journal of the Acoustical Society of America, vol. 40, Sep. 1966, p. 600-606. 9 refs.

In an experiment concerned with the binaural masking-level difference phenomenon, an attempt was made to determine the extent of the masker spectrum effective in the release of masking. The experiment utilized a uniform power-spectrum noise separated into two bands differing in interaural phase—an "inner" band surrounding the test signal and "outer" band. Binaural masking-level differences (BMLD's) were traced as functions of the interaural signal phase (0 and π rad), the relative phase of the bands (0 and π rad), and the bandwidth of the inner band. It was found that a narrow inner band homophasic with respect to signal phase could destroy much of the release of masking owing to the heterophasic outer band. The converse was not true: a wide heterophasic band (125 and 200 c.p.s. centered at 250 and 500 c.p.s., respectively) was required to produce significant release. These results depart significantly from predictions of the equalization-cancellation theory of binaural masking and furthermore do not support an assumption that BMLD is a function of the interaural noise crosscorrelation coefficient only.

A67-80278

IMPROVING NATURALNESS AND INTELLIGIBILITY OF HELIUM-OXYGEN SPEECH, USING VOCODER TECHNIQUES.

Roger M. Golden (Bell Telephone Labs., Inc., Murray Hill, N. J.).

Journal of the Acoustical Society of America, vol. 40, Sep. 1966, p. 621-624. 10 refs.

Previous analysis of helium speech has shown that the peculiar characteristic of this speech is due primarily to changes in formant frequencies of the speaker. Changes in the fundamental pitch frequency of the speaker are small and usually can be neglected. Computation of the resonant frequencies of the vocal tract, as a function of the gas mixture occupying the tract, gives a reasonable estimate of the changes that can be expected in the formant frequencies. A modified channel vocoder was designed to restore approximately the normal values of the talker's formant frequencies, while preserving his fundamental pitch frequency. This "formant-restoring vocoder" (FRV) separates the spectral energy of the helium speech into a number of narrow bands, which then amplitude-modulate lower-frequency pitch harmonics derived directly from the helium speech. Helium speech from Sealab II was processed by an FRV simulated on a digital computer. Results of several simulations indicated that considerable improvement in naturalness and intelligibility of helium speech can be achieved.

A67-80279

ANALYSIS OF SPEECH IN A HELIUM-OXYGEN MIXTURE UNDER PRESSURE.

D. J. MacLean (Bell Telephone Labs., Inc., Murray Hill, N. J.).

Journal of the Acoustical Society of America, vol. 40, Sep. 1966, p. 625-627. 5 refs.

Tape recordings made in the helium-oxygen atmosphere of the U. S. Navy Sealab II have been analyzed by spectrographic techniques. The divers breathing this gas mixture have an unusual voice quality often characterized as "Donald Duck" speech. The Sealab experiment permitted speech analysis of divers living in such an atmosphere for several days. A study of the recorded data has led to the following observations: (1) formant shifts are responsible for the unusual quality of

the helium oxygen speech; (2) the formant shifts are non-linear with the first-formant shift being greater than the higher one; (3) energy associated with fricative sounds has also been observed to shift upward; (4) pitch or fundamental frequency changes are usually not significant; (5) after several days in the preponderantly helium atmosphere of Sealab, changes occurred in the speech quality that made it sound more natural.

A67-80280**EFFECTS OF VARIOUS RESPIRATORY STIMULI ON THE DEPTH AND FREQUENCY OF BREATHING IN MAN.**

E. N. Hey, B. B. Lloyd, D. J. C. Cunningham, M. G. M. Jukes, and D. P. G. Bolton (Oxford U. Lab. of Physiol., Great Britain). *Respiration Physiology*, vol. 1, no. 2, 1966, p. 193 205 43 refs.

During quiet breathing and in hyperpnea there is a linear relation between pulmonary ventilation (VE) and tidal volume (VT), up to a VT equal to about half the vital capacity. With further increases in VE no further change in VT was found. The relation may be expressed by the equation $VE = m(VT)^k$, m is closely reproducible from day to day but differs from subject to subject and is positively correlated with the slope of the VE, alveolar carbon dioxide tension (PA_{CO_2}) response curve at high alveolar oxygen tension (PA_{O_2}). k differs little between subjects and may be related to the respiratory dead space. The relation is essentially unaltered by wide variations in PA_{CO_2} and PA_{O_2} , by metabolic acidemia, some drugs which affect respiration, and by moderate muscular exercise. When, however, the body temperature is raised, respiratory frequency, and hence parameter m, are relatively increased. The relevance of these findings to current theories on the control of respiratory frequency is briefly discussed.

A67-80281**THE EFFECT OF BILATERAL BLOCK ON VAGUS AND GLOSSOPHARYNGEAL NERVES ON THE VENTILATORY RESPONSE TO CO₂ OF CONSCIOUS MAN.**

A. Guz, M. I. M. Noble, J. G. Widdicombe, T. Trenchard, and W. W. Mushin (Charing Cross Hosp. Med. School, Dept. of Med., London, Oxford U., Lab. of Physiol., and Cardiff U., Dept. of Anaesthesia, Great Britain).

Respiration Physiology, vol. 1, no. 2, 1966, p. 206 210 13 refs.

Grant PHS HE-06851 and Wellcome Found. supported research.

The ventilatory response of a normal human subject to inhalation of a 7% CO₂, 93% O₂ mixture was studied. Following bilateral block of the vagus and glossopharyngeal nerves with 1% lignocaine, the ventilatory response to CO₂ was diminished, and this effect was associated with failure of the respiratory rate to increase as in the control experiment. This effect was thought to be due to block of vagal afferent fibers from the lungs. It was not thought to be due to chemoreceptor block because animal experiments have shown that inhalation of a high concentration of O₂ suppresses the sensitivity of peripheral chemoreceptors to hypercapnia. The typical respiratory distress associated with rebreathing CO₂ was abolished by the nerve block.

A67-80282**THE CONSTRUCTION AND REPEATABILITY OF LUNG NITROGEN CLEARANCE CURVES.**

G. Cumming and J. G. Jones (Birmingham U. Dept. of Med., Great Britain).

Respiration Physiology, vol. 1, no. 2, 1966, p. 238 248 9 refs.

Contract AF 61(052) 775

A measurement of the quantity of nitrogen in an expirate, and hence the mixed expired concentration was achieved using a respiratory mass spectrometer and an analogue computer. Nitrogen clearance curves were prepared from a physical model and from normal subjects breathing pure oxygen. The method for plotting the clearance curves has enabled time to be excluded as a parameter, permitting definition of instrumental repeatability. This was such that one liter of lung volume could be estimated with a standard deviation of 10 ml. The combined instrumental and biological variability of clearance curves from normal subjects having different tidal volumes and lung volumes was demonstrated.

A67-80283**TRANSMISSION OF EDGE INFORMATION IN THE HUMAN VISUAL SYSTEM.**

Kenneth Gaarder (St. Elizabeth's Hosp., Natl. Inst. of Mental Health, Clin. Neuropharmacol. Res. Center, Washington, D. C.).

Nature, vol. 212, Oct. 15, 1966, p. 321 323 9 refs.

PHS supported research.

Saccadic (jumping) eye movements are the characteristic way of moving the eye from point to point. When a saccade occurs, the retinal image abruptly shifts on the retina by an angle equal to the angle of movement. This fact is used as a basis for a model of transmission in the human visual system of information about the edges of objects. According to the model, a fixation saccade shifts the retinal image suddenly and thereby generates a set of edges uniquely determined by the saccadic vector. Such a set of edges is momentarily generated and transmitted in a discontinuous packet of information to the central nervous system. This is a feedback process because the output (eye movements) affects the input (retinal activity). The model is demonstrated diagrammatically and pictorially and evaluated.

A67-80284**DISCRIMINATION LEARNING BEHAVIOR IN SEVERAL SITUATIONS INVOLVING INTRA-PROBLEM STIMULUS VARIATION.**

Mymon Goldstein (Princeton U., N. J.)

Perceptual and Motor Skills, vol. 23, Oct. 1966, p. 335 340 Grant AF-AFOSR 243 63.

Human subjects performed one of seven discrimination tasks in which the standard yoked-pairs method of stimulus presentation was replaced by a method of constant and varied stimuli. It was found that reinforcement of the constant stimuli produced less difficult tasks than reinforcement of the varied stimuli. It was also found that reinforcement based on position caused difficulty, particularly when subjects were supposed to combine information about position with information about stimuli appearance.

A67-80285**SUPPLEMENTARY REPORT: ATTENTIONAL EFFECTS OF FIVE PHYSICAL PROPERTIES OF VISUAL PATTERNS.**

Larry T. Brown and Jay H. Lucas (Okla. State U., Stillwater).

Perceptual and Motor Skills, vol. 23, Oct. 1966, p. 343 346 5 refs.

Grant PHS MH-10350-02

In a replication and extension of a previous study, designed to investigate the "attentional" effects of three physical properties of visual patterns, 43 subjects viewed a series of 32 nonrepresentational patterns varying in five physical dimensions: Number of Components, Angular Variance (AV), Number of Turns, Border Width (BW), and Dissimilarity of

Border Width The construction of the patterns, the apparatus, and the procedure were exactly as in the earlier study. Verifying the earlier results, an analysis of variance of the viewing times showed that (a) patterns containing 18 components were viewed longer than those with three components ($P < .001$), (b) patterns containing components of high AV were viewed longer than those with components of low AV ($P < .001$), and (c) time spent viewing patterns containing 12-angled components did not differ from that spent viewing patterns with triangular components. In addition, the BW of the components failed to affect viewing time; however, patterns containing components differing in BW elicited longer viewing than those with components of similar BW ($P < .005$). It was noted that the latter finding serves to rule out an explanation of viewing-time data based solely on time required to scan contours.

A67-80286**RETINAL CORRESPONDENCE AND THE PERCEIVED VERTICAL.**

George S. Harker and Jane A. McLean (U.S. Army Med. Res. Lab., Fort Knox, Ky.).

Perceptual and Motor Skills, vol. 23, Oct. 1966, p. 347-360. 13 refs.

Measures of induced cyclotorsion made with two stereoscopic configurations and appropriate associated adjustment criterion are compared with measures obtained with "Volkmann's discs." Individual data for 15 observers are given, and some implications of observed individual variations in response and inconsistencies in the stereoscopic measures for stereoscopic depth perception are discussed.

A67-80287**PERCEPTION BIBLIOGRAPHY: XXXIII. PSYCHOLOGICAL INDEX NO. 29, 1922.**

C. H. Ammons and R. B. Ammons.

Perceptual and Motor Skills, vol. 23, Oct. 1966, p. 367-370. 113 refs.

In this listing are 113 items in which perceptual processes and materials are discussed.

A67-80288**A METHOD OF SIMULATING OBJECTS MOVING IN DEPTH.**

Walter C. Gogel and Henry W. Mertens (Calif. U., Santa Barbara).

Perceptual and Motor Skills, vol. 23, Oct. 1966, p. 371-377. 5 refs.

A set of equations was developed for the simulation on a screen of the movement of an object or surface toward or away from an observer by the movement of a positive photographic transparency of the object or surface away or toward a point source. The general case was developed for simulating objects in which the distance of the observer from the screen was constant but not necessarily equal to the distance of the point source from the screen. Equations were developed relating the dimensions of the rigid transparency to those of the rigid simulated object. These equations, under a wide variety of conditions permit the simulation of surfaces or objects moving in depth at any designated linear speed or acceleration with respect to the observer.

A67-80289**THE HERITABILITY OF VISUALIZATION, PERCEPTUAL SPEED AND SPATIAL ORIENTATION.**

R. Travis Osborne and A. James Gregor (Ga. U., Athens and Tex. U., Austin).

Perceptual and Motor Skills, vol. 23, Oct. 1966, p. 379-390. 50 refs.

Thirty-three pairs of MZ twins and 12 pairs of like-sexed DZ twins, 32 boys and 58 girls, 40 of whom were Negro and 50 white, whose ages ranged from 13 to 18, were given a battery of psychological tests which included (1) the Surface Development Test, (2) Porteus Mazes, (3) the Newcastle Spatial Test, (4) the Paper Folding Test, (5) the Identical Pictures Test, Perceptual Speed, (6) the Objective-Aperture Test, Form B, and (7) Cube Comparisons. Using three different heritability ratios, (1) The Holzinger heritability coefficient, (2) the Heritability ratio proposed by Nichols, and (3) the F ratio (Block), the relative intra-pair similarity of MZ and like-sexed DZ twins on the selected perceptual tasks was determined. All the MZ correlations were greater than the corresponding r_s for the DZ twins. Four of the nine differences were significant ($p < .05$). The range of heritability coefficient ratios (Holzinger) was from .15 to .89, with MZ intraclass r_s ranging from .46 to .91, and DZ r_s from .08 to .72. The agreement among tests suggests that the mental abilities represented are independently inherited with as much as 89% of the within-family variance accounted for by hereditary factors.

A67-80290**EFFECT OF VARIATION IN DISTANCE BETWEEN SUBJECT AND OBJECT ON SPACE LOCALIZATION.**

Joseph Glick (Yale U., New Haven, Conn.) and Seymour Warner (Clark U., Worcester, Mass.).

Perceptual and Motor Skills, vol. 23, Oct. 1966, p. 438.

Grant PHS MH 00348.

Two groups of 12 subjects performed viewing task under three conditions of fixation (right edge, left edge, center of square). Subjects sat facing the center of the front wall of a dark room and adjusted the fixated square until the fixation point "appears straight-ahead." Group I viewed an 8-in. square at a distance of 8 ft; Group II a 2-in. square at 2 ft. Although retinal size was controlled, subjects were aware of the approximate distance of the object. Obtained shifts due to fixation and distance varied significantly (Interaction $F = 3.37$, $df = 2/44$, $P < .05$), according to expectation. For Group I displacement was away from the side of fixation (final adjusted position of fixated left edge was $0^{\circ}17'$ to right of fixated right edge), while for Group II displacement was toward the side of fixation (final adjusted position of fixated left edge was $3^{\circ}45'$ to left of fixated right edge). The demonstrated influence of distance, as well as cognitive variation, suggests that these factors should be taken into account in both theory and experimental design in the study of space localization.

A67-80291**MOTOR SKILLS BIBLIOGRAPHY: LI. PSYCHOLOGICAL ABSTRACTS, 1929, VOLUME 3.**

C. H. Ammons and R. B. Ammons.

Perceptual and Motor Skills, vol. 23, Oct. 1966, p. 447-450. 107 refs.

References (107) of research on motor skills are listed alphabetically.

A67-80292**SIGNAL PRESENTATION RATE, AUDITORY THRESHOLD, AND GROUP VIGILANCE.**

Richard L. Martz (U.S. Naval Submarine Med. Center, Auditory Res. Div., U. S. Naval Submarine Base, New London, Groton, Conn.).

Perceptual and Motor Skills, vol. 23, Oct. 1966, p. 463-469. 5 refs.

Auditory thresholds were obtained during the course of a single, two-hour vigilance session from eight groups of 11 to 14 rated and non-rated Navy enlisted men each, to one of four signal rates: 1/2 hr., 2.5/hr., 7.5/hr., and 15/hr. Subjects of each group were tested together in a dark, unlighted, noise-homogeneous room in close physical (and possibly tactile and vibratory) proximity but without visual or acoustic interaction. Each subject wore earphones and pressed a microswitch to report single tones in trains of 12 successive tones ranging in 2-db steps from roughly 14 db below to 10 db above the average subject's threshold. Results showed (a) a positively accelerated linear relation between auditory detection and log signal rate, (b) decrements of 1 to 10 db occurring early in the first half of the watch in all groups (and virtually all subjects') performance at all signal rates and (c) large individual differences permitting an arbitrary significant separation of "better" and "poorer" performers.

A67-80293

PERCEPTION BIBLIOGRAPHY: XXXIV. PSYCHOLOGICAL INDEX NO. 30, 1923.

R. B. Ammons and C. H. Ammons.

Perceptual and Motor Skills, vol. 23, Oct. 1966, p. 479-482. 103 refs.

Alphabetical listing of 103 references of work in perception and closely related fields.

A67-80294

CHANGING PERCEPTION OF AN "INCOMPLETE" TRAPEZOID IN ROTATION.

Thomas H. Cook and Roy B. Mefferd, Jr. (Veterans Admin. Hosp., Psychiat. and Psychosomat. Res. Lab., Houston, Tex.).

Perceptual and Motor Skills, vol. 23, Oct. 1966, p. 509-510. 11 refs.

NIMH supported research.

Mean relative durations of six kinds of apparent motion produced with two vertical luminous rods varied significantly ($N = 10$). Ten naive humans were used as subjects. The pattern of motion was like that obtained with "complete" trapezoids in rotation.

A67-80295

AN ADAPTATION-LEVEL INTERPRETATION OF REINFORCEMENT.

William Bevan (Kan. State U., Manhattan).

Perceptual and Motor Skills, vol. 23, Oct. 1966, p. 511-531. 29 refs.

Contract ONR 3634(O1).

This paper summarizes a theory of reinforcement, based on the concept of adaptation level that was developed in the late 1950's by Bevan and Adamson to account for contrast effects, distinctiveness of cur., partial reinforcement effects, and other reinforcement phenomena within a single conceptual setting. It also reviews a program of experiments suggested by this approach that has been carried out in the writer's laboratory.

A67-80296

VISUAL SEARCH AND STIMULUS ORIENTATION.

Robert Brown and Kenneth T. Strongman (Exeter U., Great Britain).

Perceptual and Motor Skills, vol. 23, Oct. 1966, p. 539-542. 5 refs.

Two experiments were carried out to determine the relative efficacy of visual search with horizontal and vertical lists of letters. Experiment 1 showed that visual search was faster with horizontally presented material. In Experiment 2 this finding was analyzed further. The factors of list orientation and letter orientation affected search times, but the actual letter-to-letter relationship within a list was unimportant. Results were discussed briefly in terms of their relevance to studies of discrimination.

A67-80297

MOTOR SKILLS BIBLIOGRAPHY: LII. PSYCHOLOGICAL ABSTRACTS, 1930, VOLUME 4.

R. B. Ammons and C. H. Ammons.

Perceptual and Motor Skills, vol. 23, Oct. 1966, p. 543-546. 104 refs.

Selected items (104) on motor skills are listed alphabetically.

A67-80298

PHENOMENAL SLANT AS A FUNCTION OF AMBIGUITY OF CONTOUR PERSPECTIVE.

A. H. Smith (Defence Res. Med. Labs., Toronto, Canada).

Perceptual and Motor Skills, vol. 23, Oct. 1966, p. 587-594. 12 refs.

Observers judged the slants of a rectangle and three trapezoids, with complete and broken outlines, exposed under reduced viewing conditions at slants of 10°, 25°, 40°. All forms were of the same height and area. The smallest projective angular convergence of the sides of the frontal-parallel trapezoids was larger than that of the rectangle at its greatest slant. The slant estimates of the monocular and binocular groups for the trapezoids differed significantly, those for the rectangle did not. Observers distinguished effectively between the rectangle and the trapezoids but not among the trapezoids. Estimates for particular forms with complete and broken outlines did not differ significantly. The data were interpreted as limiting the contour perspective theory of slant perception and as demonstrating a subjective shape influence in accordance with either the Helmholtzian or the Gestaltist type of explanation.

A67-80299

TIME RELATIONSHIP AND TRANSMISSION MODALITY IN A LEARNING TASK INVOLVING WORD-OBJECT PAIRS.

Donald J. Mueller (Wis. U., Milwaukee), Adrian P. Van Mondfrans (Wis. U., Madison), Adrian Chan (Utah U., Salt Lake City), and Robert M. W. Travers (Western Mich. U., Kalamazoo).

Perceptual and Motor Skills, vol. 23, Oct. 1966, p. 615-622. 9 refs.

Grant U.S. OEC-997.

Paired-association learning was undertaken involving semi-meaningful objects and bisyllabic words. Three conditions of stimulus presentation were used, viz., object followed by word, word followed by object, and simultaneous word and object. In addition, the words were presented either visually or auditorially. The simultaneous presentation facilitated learning more than the object-word sequential order but was not significantly more facilitating than the word-object sequential order. Cross-modality associations were acquired as readily as associations involving a single sense modality.

A67-80300

MOON ILLUSION AND SIZE-DISTANCE INVARIANCE: AN EXPLANATION BASED UPON AN EXPERIMENTAL ARTIFACT.

James W. Dees (McDonnell Aircraft Corp., St. Louis, Mo. and Akron U., Ohio).

Perceptual and Motor Skills, vol. 23, Oct. 1966, p. 629-630. 5 refs.

The apparent size and the size constancy explanations of the moon illusion are supported by an explanation of an informal observation made during the course of an experiment. Size-distance invariance is related to this explanation.

A67-80301

RELATIVE CONTRIBUTIONS OF CONVERGENCE AND RETINAL DISPARITY IN THE STEREOPSIS CUE OF SIZE AND DISTANCE.

James W. Dees (McDonnell Aircraft Corp., St. Louis, Mo. and Akron U., Ohio)

Perceptual and Motor Skills, vol. 23, Oct. 1966, p. 645-646.

This paper reports the results of the fourth study in a series designed to describe more precisely the accuracy of visual size and distance estimation. Data concerning the convergence cue exclusively are compared with data concerning convergence plus retinal disparity given in a previous report.

A67-80302

COMPUTER BASED ADAPTIVE TRAINING APPLIED TO SYMBOLIC DISPLAYS.

Angelo Mirabella and Jerry C. Lamb (Gen. Dyn./Elec. Boat, Groton, Conn.)

Perceptual and Motor Skills, vol. 23, Oct. 1966, p. 647-661. 27 refs.

Contract NTDC N61339-1594.

Three experiments were conducted to explore the effects of adaptive vs. nonadaptive training upon performance in a visual target detection task involving symbolic data displays. The results indicated that increasing display complexity during training and requiring subjects to respond actively to the displays were more effective than maintaining a constant level of complexity and requiring only passive viewing of the displays. But there was no evidence to suggest that changing complexity in an adaptive fashion was more effective than changing complexity in an arbitrary stepwise fashion. Additional findings indicated that maintaining subjects at a high nominal error rate during training was not necessarily detrimental to post-training performance. A high error rate was at least as effective as a low rate, where the high rate was reached by increasing error rate in a stepwise fashion.

A67-80303

EFFECTS OF FREE INSPECTION AND FIXATION ON THE MAGNITUDE OF THE POGGENDORFF ILLUSION.

Stanley Novak (Vassar Coll., Poughkeepsie, N. Y.)

Perceptual and Motor Skills, vol. 23, Oct. 1966, p. 663-670. 8 refs.

Eighteen informed female observers were studied under three viewing conditions: free inspection without fixation cross, free inspection with central fixation cross, and fixation with central fixation cross. Transversal angles of 22.5°, 45.0°, 67.5°, and 90.0° were investigated under each viewing condition and constant error measures of the illusion obtained. Addition of the fixation cross did not significantly change the illusion in the free inspection conditions for any of the angles. Illusion magnitude again varied as a function of angle. Fixation of the cross significantly reduced but did not abolish the illusion for the 22.5°, 45.0°, and 67.5° angles. No significant magnitude of illusion was found under free inspection for the 90.0° angle in a direction opposite to that observed for the smaller angles.

A67-80304

TIME SEPARATION PITCH ASSOCIATED WITH NOISE PULSES.

Max E. Mc Clellan and Arnold M. Small, Jr. (Iowa U., Iowa City).

(*Acoust. Soc. of Am., 70th Meeting, St. Louis, Mo., Nov. 1965*)

Journal of the Acoustical Society of America, vol. 40, Sep. 1966, p. 570-582. 22 refs.

Previous research has shown that time separation pitch (TSP) is elicited by the monaural presentation of two ac or dc pulse trains, one train delayed with respect to the other, and is related to the reciprocal of time separation between leading edges of proximal pulses of the two trains. TSP has not been observed previously using uncorrelated noise pulses. On the assumption that TSP is mediated by an autocorrelational process, it was predicted that TSP would obtain using correlated-noise pulses that were produced by an "acoustic delay" system. Uncorrelated-noise pulses served as a control condition. Subjects matched the pitch of a pure tone to the pitches associated with the pulse trains. The results were as predicted. A TSP-like effect arising from continuous-noise samples was discussed and shown to be identical to TSP and therefore, consonant with an autocorrelational theory. It was concluded that, at least for noise stimuli, temporally discrete waveforms are not necessary to elicit TSP perception; however, a high correlation between temporally adjacent waveforms is necessary to "trigger" TSP perception.

A67-80305

SKELETAL MUSCLE BLOOD FLOW DURING HYPERCAPNIC HYPERVENTILATION.

T. W. Lamb, M. M. Cebrik, J. S. Kaiser, C. F. Belanger, Jr., and A. B. Munro (Dartmouth Med. School, Dept. of Physiol., Hanover, N. H.)

Respiration Physiology, vol. 1, no. 3, 1966, p. 249-257. 18 refs.

Grants NIH HE 2888(08) and 5T GM 63-04.

Individual differences exist in ventilatory responsiveness to inspired mixtures of carbon dioxide. The data of Schaefer suggest that the subjects with high ventilatory responsiveness are ones who store CO₂ in the body at a low rate during acute, mild hypercapnia, while subjects with low ventilatory responsiveness appear to store CO₂ at a high rate under identical conditions. The rate of delivery of CO₂-rich blood to one of the likely sites for major, short-term CO₂ storage was estimated by measuring forearm blood flow using venous-occlusion plethysmography while the skin circulation was minimized with percutaneous electrophoresis of epinephrine. During hypercapnia resulting from breathing 2%, 4% and 6% CO₂ in 21% oxygen, all subjects showed small significant increases in mean muscle blood flow. The maximum increase was approximately 40% above control levels and was usually seen during exposure to 4% CO₂. No correlation was found between ventilatory responsiveness to CO₂ and muscle blood flow response. The individual differences in rate of storage of CO₂ during hypercapnia cannot be explained by differences in skeletal muscle blood flow response.

A67-80306

DETERMINATION OF MIXED VENOUS O₂ AND CO₂ TENSIONS AND CARDIAC OUTPUT BY A REBREATHING METHOD.

P. Cerretelli, J. C. Cruz, L. E. Farhi, and H. Rahn (N. Y. State U., Dept. of Physiol., Buffalo).

Respiration Physiology, vol. 1, no. 3, 1966, p. 258-264. 19 refs. WADC supported research.

Rebreathing from a bag containing a volume approximating the functional residual capacity of 8-9% CO₂ in N₂ results

in alveolar O_2 and CO_2 tensions which becomes stable four to eight sec. after the beginning of rebreathing and are maintained for approximately six sec. These tensions are believed to reflect mixed venous blood tensions. Ranges at rest are from 35 to 52 mm for P_{O_2} and 44 to 47 mm. for P_{CO_2} . During exercise, P_{O_2} decreases and at an oxygen uptake of two liters/min. is of the order of 30 mm Hg. Cardiac output values calculated from these data agree well with figures obtained with another method.

A67-80307**BREATH-TO-BREATH VARIATIONS OF PULMONARY GAS EXCHANGE IN RESTING MAN.**

P. Dejours, R. Puccinelli, J. Armand, and Monique Dicharry (Faculté de Méd., Lab. de Physiol., and Centre Marie-Lannelongue, Paris, France)

Respiration Physiology, vol. 1, no. 3, 1966, p. 265-280. 23 refs.

Breath-to-breath variations of ventilation and of composition of alveolar gas were studied for periods of several minutes in resting human subjects breathing air at sea level. The dispersion of alveolar carbon dioxide tension (PA_{CO_2}) is much smaller than the dispersion of alveolar oxygen tension (PA_{O_2}). On a P_{CO_2} - P_{O_2} diagram, alveolar P_{CO_2} and P_{O_2} points of successive breaths form an elliptical cloud which crosses the R lines. It is possible to compute the volumes of CO_2 and O_2 exchanged between the alveolar gas and the pulmonary blood during one ventilatory cycle, and then to calculate an alveoli-blood respiratory quotient. This quotient varies more than the common respiratory quotient between inspired air and alveolar gas. This is not surprising, since the variations of the gas exchange at the alveolo-capillary level are damped by the lung volume capacity. The relative variations of V_{CO_2} and V_{O_2} within successive ventilatory cycles are about the same. The variations are probably due to breath-to-breath changes of (1) the mean capillary blood flow, Qc, (2) Ca_{CO_2} , (3) the mixed venous blood composition. Because V_{CO_2} and V_{O_2} are positively correlated with VA, the ratios of V_{CO_2}/VA and V_{O_2}/VA are less variable than they would be without these correlations. One of several factors which may account for these relations is a relative stability of VA/Qc , and increase of VA being accompanied by an increase of capillary blood flow Qc.

A67-80308**RESPIRATORY INSENSITIVITY TO HYPOXIA IN CHRONICALLY HYPOXIC MAN.**

J. W. Severinghaus, C. R. Bainton, and A. Carcelen (Calif. U., San Francisco Med. Center, Cardiovascular Res. Inst. and Dept. of Anesthesia, and U. Cayetano Heredia of Peru, Lima)

Respiration Physiology, vol. 1, no. 3, 1966, p. 308-334. 69 refs.

Grants PHS HE-06285, RG-08576, 5T1-GM-64 and Res. Career Award 1-K6-HE-19, 412.

Respiratory chemosensitivity was studied in Cerro de Pasco, Peru (4330 m.) in five normal highlanders (H), 6 highlanders with chronic mountain polycythemia (CMP) without right heart failure, and seven lowlanders (L) acclimatized for 1-40 weeks. Mean age of groups was 35 and pulmonary function was normal. Hematocrit averaged 51.7 in L, 60.1 in H and 75.4 in CMP. Alveolar carbon dioxide tension (PA_{CO_2}) was 27.8 ± 0.6 mm. Hg. (s.e.) in L, 31.9 ± 0.7 in H and 34.8 ± 0.9 in CMP. Similarity of CO_2 response curve slopes of 2.6 liters/min./m.²/mm. Hg in L, 2.5 in H and 2.2 in CMP suggested that medullary chemoreceptor sensitivity was normal although set chemically, by CSF HCO_3^- adjustment, to operate at differing P_{CO_2} levels in the three

groups. However, the ventilatory response to hypoxia alveolar oxygen tension (PA_{O_2})—40 mm. Hg failed to induce hyperpnea in either H or CMP. It is postulated that chronic hypoxia results in desensitization of the carotid body hypoxia chemoreceptors, and the reduced stimulus permits ventilation to fall and P_{CO_2} to rise. This process may be etiologic in chronic mountain sickness.

A67-80309**RESTORATION OF VITAL FUNCTIONS OF THE ORGANISM IN CLINICAL DEATH DUE TO ACUTE ANOXIA [VIDNOVLENNIA ZHYTTEVO VAZHLYVYKH FUNKTSII ORHANIZMU PRY KLINICHNII SMERTI, VYKLYKANII HOSTROIU ANOKSIIIEIU].**

M. M. Syrotynin, V. D. Iankovskiy, and I. U. F. Heria (UkrSSR, Acad. of Sci., O. O. Bohomolits Inst. of Physiol., Kiev).

Fiziologichnyi Zhurnal, vol. 12, Sep. Oct. 1966, p. 565-570. 7 refs. In Ukrainian.

After clinical death due to anoxia dogs were reanimated by acute anoxia, the artificial lung, or by a modification of this method. In some cases the organism of the reanimated dog was washed with blood by means of cross circulation with a donor according to the scheme: donor artery—vein of reanimated dog; carotid artery of reanimated dog—donor vein. The experimental animal was placed in an altitude chamber from which air was evacuated during 40 to 115 sec. until a minimum pressure of 18 to 28 mm. Hg was attained. Return to atmospheric pressure took 20-50 sec. The dogs were kept in the chamber from 1.5 to 6 min. The period of clinical death varied from 10.5 to 24 min. Eight of sixteen dogs were reanimated, two of them with death periods of 10.5 and 18.0 min. lived for a long time with all vital functions restored. This shows that the artificial circulation method can be used to attain complete reanimation of dogs even after the gravest clinical death due to rapid decompression.

A67-80310**REANIMATION OF DOGS AFTER CLINICAL DEATH DUE TO RADIAL ACCELERATION [REANIMATSIYA SOBAK PISLIA KLINICHNOI SMERTI VID VPLYVU NA NYKH RADIALNOHO PRYSKORENNIA].**

V. D. Iankovskiy, O. P. Morozov, and M. P. Adamenko (UkrSSR, Acad. of Sci., O. O. Bohomolits Inst. of Physiol., Dept. of Physiol. of Hypoxia and Hyperoxia Conditions, Kiev).

Fiziologichnyi Zhurnal, vol. 12, Sep. Oct. 1966, p. 571-575. 5 refs. In Ukrainian.

Dogs were reanimated after clinical death was produced by an exposure to radial acceleration of 40 g. The clinical death lasted from 15 min. 45 sec. to 19 min. 30 sec. The animals were brought back to life by the artificial blood circulation method. The dogs recovered completely and were known to be alive three years after the experiment. Most of them produced normal litters of puppies.

A67-80311**COMPREHENSIVE INVESTIGATION OF THE HUMAN ORGANISM UNDER CONDITIONS OF HIGH-ALTITUDE ACCLIMATIZATION BY STAGES [KOMPLEKSNE DOSLIDZHENNIA ORHANIZMU LIUDYNY V UMOVAKH STUPINCHATOI VYSOKOHIRNOI AKLIMATYZATSII].**

V. I. Danyleiko, V. P. Dudarev, H. O. Leonteva, V. V. Matsynin, P. P. Pivtorak, and I. F. Sokolianskyi (UkrSSR, Acad. of Sci., O. O. Bohomolits Inst. of Physiol., Dept. of Physiol. of Hypoxia and Hyperoxia Conditions, Kiev).

Fiziologichnyi Zhurnal, vol. 12, Sep. Oct. 1966, p. 582-592. 24 refs. In Ukrainian.

Studies of a group of subjects going through high-altitude acclimatization by stages were conducted under conditions of a plain and at altitudes 2100, 2900, 3700 and 4200 meters above the sea level. Data were obtained on the state of external respiration, oxygen tension and bioelectrical activity of the human muscle. It was found that in the process of high-altitude acclimatization the alterations in the red blood were most pronounced at 4800 m. above sea level. The changes in the electrophoretic mobility of the hemoglobin fractions were observed from the first stages of high-altitude acclimatization. In the serum there was an increase in the quantity of globulins. The quantity of oxygen consumed by the subjects somewhat exceeded the initial and expected values. The increase in oxygen tension in the human muscle after inhalation of oxygen rose as acclimatization proceeded. There was a general enhancement in the muscular tone of the subjects. In most investigations inhalation of oxygen was attended by a fall in the bioelectrical activity of the muscles. The paper contains data on the interrelation between various functional indices, characterizing some aspects of human vital activity under conditions of high altitude acclimatization by stages.

A67-80312

CHANGES IN EXTERNAL RESPIRATION AND PERIPHERAL BLOOD COMPOSITION IN RATS UNDER THE EFFECT OF TRANSVERSE ACCELERATIONS [ZMINY ZOVNISHNOHO DYKHANNIA I SKLADU PERYFERYCHNOI KROVI BILYKH SHCHURIV PID VPLYDOM POPERECHNIU SPRIAMOV-ANKYH PRYSKOREN].

V. P. Dudariev.

Fiziologichnyi Zhurnal, vol. 12, Sep.-Oct. 1966, p. 595-600. 19 refs. In Ukrainian.

With a rise in acceleration the respiration rate in albino rats was decreased, while its intensity was somewhat increased. Under conditions of a rarefied atmosphere (2000-6000 m) these changes were more pronounced and cessation of respiration was earlier. Changes in the composition of the peripheral blood also depended on the degree of acceleration and the time that has elapsed after its action. During the first few minutes after the effect a rise was noted in the number of erythrocytes and hemoglobin concentration which subsequently decreases to the initial value and lower. Changes in the leucocyte count took the form of a slight neutropenia, without displacement of the neutrophil nuclei to the left, and eosinophilopenia or lymphocytosis. Injection of cortisone and ACTH, without inducing changes of the red blood corpuscles, exerted a considerable elevating effect on the resistance to the action of radial acceleration. The acclimatization of animals to high-mountain conditions, attended by an increase in the number of erythrocytes and hemoglobin concentration led to the increase of resistance to the effect of acceleration.

A67-80313

AGE PECULIARITIES OF HEMODYNAMIC CHANGES WITH REDUCED OXYGEN CONTENT IN THE AIR [VIKOVY OSOBLIVOSTI ZMIN HEMODYNAMIKY PRY ZNYZHENNI VMISTU KYSNIU V POVITRI].

M. M. Kohanovska and V. V. Turanov (UkrSSR, Acad. of Sci., O. O. Bohomolits Inst. of Physiol., Dept. of Age Physiol., Kiev).

Fiziologichnyi Zhurnal, vol. 12, Sep.-Oct. 1966, p. 632-639. 47 refs. In Ukrainian.

The authors studied the changes in the hemodynamic indices in puppies aged two-three weeks, two-three months, six-seven months and in adult dogs with reduced oxygen content in the air. In contrast to adult dogs, puppies at an early stage of ontogenesis do not respond with intensified circulation to oxygen deficiency in air. An increase in the

minute volume of circulation during hypoxia first appears in two three-month-old puppies, but the reaction is unstable and transient at this age. In puppies at the age of puberty compensation of oxygen deficiency in the air occurs because of pulse acceleration, rise in blood pressure, and increase in the minute volume of circulation. The age peculiarities in puberty take the form of a higher threshold of hemodynamic changes, less acute changes in hemodynamics during hypoxia and in higher circulatory indices in the normal state.

A67-80314

CHANGES IN THE BASIC HEMODYNAMICS PARAMETERS DURING OXYGEN DEFICIENCY IN INSPIRED AIR [ZMINY OSNOVNYKH PARAMETRIV HEMODYNAMIKY PRY NESTACHI KYSNIU U VDYKHUVANOMU POVITRI].

S. A. Bershtein (UkrSSR, Acad. of Sci., O. O. Bohomolits Inst. of Physiol., Dept. of Circulatory Physiol., Kiev).

Fiziologichnyi Zhurnal, vol. 12, Sep.-Oct. 1966, p. 649-654. 22 refs. In Ukrainian.

The author investigated the changes in cardiac output, total peripheral resistance and systemic arterial blood pressure in experimental animals during respiration of gas mixtures containing 7.5 and 6% oxygen in nitrogen. The experiments were conducted on cats under chloral nembutal narcosis. Determination of the basic indices of hemodynamics was carried out by the thermodilution method. It was found that a fall in oxygen content in the inspired air leads to pronounced hypertension due to the conjunction of increase in cardiac output and in total peripheral resistance. Cardiac output increases due to an increase in systolic index. With a rise in the impoverishment of the inspired air the cardinal role in the retention of the proper systemic arterial pressure level belongs to increase in cardiac output.

A67-80315

STATE OF DERMAL CONDUCTIVITY IN TRANSISTORY HYPOXIA [DO PYTANNIA PRO STAN ELEKTROPROVID-NOSTI SHKIRY PRY KOROTKOCHASNII HIPOKSII].

P. P. Slynko (UkrSSR, Acad. of Sci., O. O. Bohomolits Inst. of Physiol., Dept. of Physiol. of Hypoxia and Hyperoxia Conditions, Kiev).

Fiziologichnyi Zhurnal, vol. 12, Sep.-Oct. 1966, p. 655-660. 12 refs. In Ukrainian.

A portable device, operating on alternating current of low frequency and voltage from a battery, has been developed for the electrometric or graphic recording of the electrodermal response, electric conductivity, permeability, intensity of perspiration, and skin temperature, with the use of special electrodes and transducers.

A67-80316

MAGNESIUM DEPLETION IN NORMAL MAN.

Michael J. Dunn and Mackenzie Walser (Johns Hopkins U., School of Med., Dept. of Med. and Dept. of Pharmacol. and Exptl. Therap., Baltimore, Md.).

(*Am. Federation for Clin. Res., Southern Sect. Meeting, New Orleans, Jan. 29, 1966*).

Metabolism, vol. 15, Oct. 1966, p. 884-895. 29 refs.

Grants PHS AM-02306, FR-35, and GM-K3-2583.

Two normal subjects were depleted of magnesium for 39 and 49 days, respectively, by means of a diet low in magnesium (1 to 2.5 mmoles), high in calcium (30 to 50 mmoles), and normal in protein caloric content. Intravenous infusions of sodium and potassium sulfate were given frequently in order to augment renal magnesium loss. However, the principal magnesium loss occurred via fecal excretion, which exceeded intake, evidently as a result of the high calcium intake. Both calcium and magnesium clearance fell markedly. Cumulative

negative magnesium balance amounted to 92 and 86 mmoles, respectively, or 8 to 10% of body magnesium. Calcium balance was zero. No increase in magnesium loss followed the ingestion of 10 ounces of whiskey daily. Plasma calcium remained normal, but plasma and erythrocyte magnesium fell moderately. Muscle magnesium remained normal; consequently, the source of the lost magnesium must have been bone. No untoward effects occurred.

A67-80317

THERAPEUTIC EXERCISE IN MOTION PROBLEMS, PART I OF III.

Robert H. Jebesen.

Northwest Medicine, vol 65, Sep. 1966, p. 742-747.

Grant Vocational Rehabil Admin, no. 3

The neuro-muscular-skeletal system is kept in normal, functioning condition by normal use. Immobilization permits shortening and loss of elasticity. Deformity and restriction of motion can be prevented or corrected by therapeutic exercise, prescribed according to the patient's age, general condition, and specific medical problem.

A67-80318

EVALUATION OF VESTIBULAR TOLERANCE BY METHOD OF CONTINUOUS CULMINATION OF CORIOLIS ACCELERATION [VESTIBULIARNYI OTBOR METODOM NEPRERYVNOI KUMULIATSII USKORENII KORJOLISA].

S. S. Markarian, E. M. Uganov, and I. A. Sidel'nikov.

Voenna-meditsinskii Zhurnal, no. 9, Sep. 1966, p. 59-62.

In Russian.

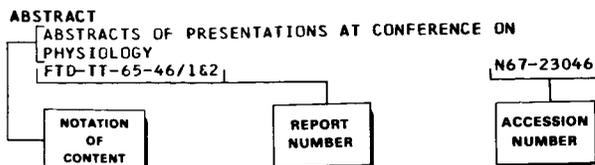
In selecting crews for space missions the stability of the vestibular apparatus is of the utmost importance. Testing of the candidates for tolerance to pitch, roll and yaw can be accomplished by a simple method of exposure to a continuous Coriolis effect in a modified Barany chair. Bending of the chair or inclining it from side to side during chair revolution of 180°/sec. produced various symptoms of motion sickness. The cause of disturbance may be attributed to a simultaneous stimulation of the receptors of the semilunar canals and the otoliths. A subject who develops symptoms in less than two minutes of testing is not considered for space duty. Individuals can be classified on the basis of duration of tolerance, with the maximum performance being 20 minutes.

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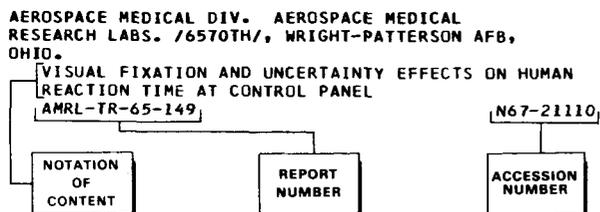
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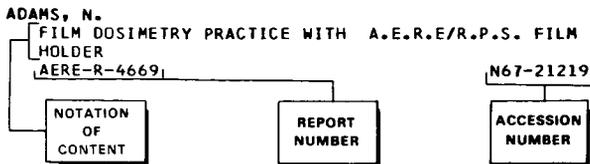
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